

October 2011

NIEHS Spotlight



[Zeldin named NIEHS scientific director](#)

As the latest addition to its top leadership team, NIEHS has named Acting Director of Clinical Research Darryl Zeldin, M.D., as its new scientific director, effective Oct. 23.



[NIEHS celebrates Postdoc Appreciation Week](#)

NIEHS joined institutions nationwide Sept. 23, as it paid tribute to its postdoctoral fellows with a celebration on the final day of National Postdoc Appreciation Week.



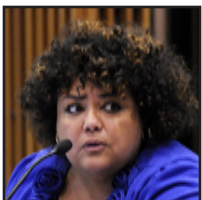
[Birnbaum addresses ISEE Barcelona](#)

NIEHS/NTP Director Linda Birnbaum, Ph.D., gave a keynote lecture at the annual meeting of the International Society for Environmental Epidemiology Sept. 13-16.



[CFC launches 2011 campaign](#) Video

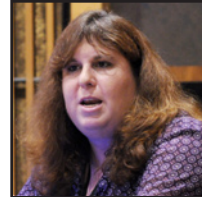
NIEHS will kick off its 2011 Combined Federal Campaign Oct. 4 with a goal of raising more than \$100,000 in pledges for charitable contributions from employees.



[Council briefed on new developments at NIEHS](#)

There's never a dull moment at NIEHS. That truth was quite evident at the latest meeting of the National Advisory Environmental Health Sciences Council Sept. 1-2.

Science Notebook



[Council scientific talks showcase diverse research interests](#)

Two scientific presentations at the 134th meeting of Council Sept. 2 highlighted the vast range of the research interests supported by NIEHS.



[Conference highlights toxicogenomics, bioinformatics and computational biology](#)

The conference was webcast in two-way transmission to researchers at EPA's National Center for Environmental Assessment in Washington, D.C. and Health Canada.



[Toxicology and infectious disease research: Is it time for more collaboration?](#)

Facilitated by Mike Humble, Ph.D., the workshop examined the state of the science to determine the gaps and set directions for future research initiatives in the field.



[NIDA director visits NIEHS, provides addiction research update](#) Video

National Institute of Drug Abuse Director Nora Volkow, M.D., presented an update on drug abuse and addiction research during a noontime presentation at NIEHS Sept. 23.

NIEHS Spotlight



[Guillette honored by Heinz Foundation](#) Video

Former NIEHS grantee Louis Guillette, Ph.D., became the latest in a long list of NIEHS-funded environmental health scientists to receive the coveted \$100,000 Heinz Award.



[NIEHS launches GuLF STUDY media tour](#) Video

As part of its recruitment for the GuLF STUDY (Gulf Long-term Follow-up Study), NIEHS conducted the first of four fall media tours Aug. 31-Sept. 1 in southern Alabama.



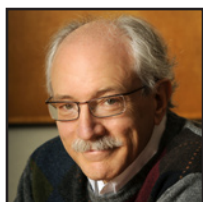
[NRC report offers lawmakers new approach for health impact assessment](#)

In a new report, the National Research Council introduced a comprehensive, six-step framework for assessing the potential health impact of new policies, plans, and projects.



[Superfund signs Memorandum of Understanding with EPA](#)

This MOU formalizes an agreement between the NIEHS Superfund Research Program and the EPA office responsible for overseeing the cleanup of Superfund sites.



[Woychik addresses NY Committee for Occupational Safety and Health](#)

NIEHS Deputy Director Rick Woychik, Ph.D., spoke at a conference Sept. 16 on "Protecting Worker and Community Health: Are We Prepared for the Next 911?"

Science Notebook



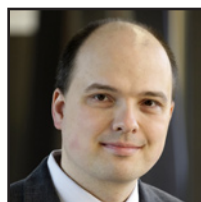
[Applying 21st century toxicology to green chemistry](#)

Scientists aiming to develop real-world solutions for problem chemicals gathered at a workshop Sept. 20-21 in Washington, D.C.



[Meyer returns to NIEHS to discuss mitochondrial DNA damage](#)

Former Laboratory of Molecular Genetics fellow Joel Meyer, Ph.D., summarized his research about the persistent effects of environmental agents on mitochondrial DNA.



[Menthol may promote nicotine addiction](#)

Findings from a new study that appeared online in the September 8 issue of The FASEB Journal could help smokers understand why their habit is so hard to break.



[Superfund study examines carcinogenicity of nickel nanoparticles](#)

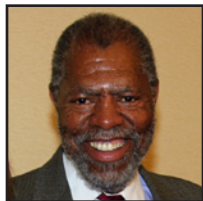
Brown University researchers have published a study showing evidence nickel nanoparticles activate a cellular pathway that contributes to cancer in human lung cells.



[NTP alternatives center showcases accomplishments](#)

NTP representatives attended the Eighth World Congress on Alternatives and Animal Use in the Life Sciences Aug. 21-25 in Montreal, Canada.

NIEHS Spotlight



[Olden honored at environmental public health conference](#)

Former NIEHS Director Kenneth Olden, Ph.D., received the 2011 Richard and Barbara Hansen Leadership Award Sept. 8 from the University of Iowa College of Public Health.



[Cavanaugh and Wilson group paper highlighted by JBC](#)

The Sept. 9 issue of the Journal of Biological Chemistry features an image from the paper on its cover and a profile of its first author, postdoctoral fellow Nisha Cavanaugh, Ph.D.



[Writer and editor kick off trainees' brown bag lunch series](#)

The NIEHS Trainees Assembly kicked off its new series of career-development brown bag lunches Sept. 9 with a session on scientific writing opportunities.



[LSB fellow makes move to private sector](#)

Kelly Mercier, Ph.D., made a major transition in her career to a position as an applications scientist at the private-sector diagnostic company LipoScience.



[Gottesman announces new intramural research website](#)

On Sept. 19, Michael Gottesman, M.D., deputy director of the NIH Intramural Research Program announced the launch of a new website to highlight in-house researchers.

Science Notebook



[Researchers discover how *Geobacter* remove uranium contamination](#)

A new study funded in part by NIEHS has revealed that *Geobacter* bacteria use their conductive hair-like filaments or pili to clean up nuclear waste and other contamination.



[Women scientists shine at NCSOT meeting](#)

What made this meeting stand out from previous ones was its domination by women scientists, who delivered three of the four talks at the event and won all of its awards.



[Epigenomics data goes public](#)

The NIH Roadmap Epigenomics Mapping Consortium is delivering on its promise of developing a public resource of human epigenomic data.



[SRP researchers quantify PCB pollution in East Chicago harbor](#)

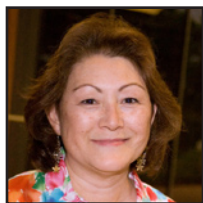
NIEHS-funded researchers have found high levels of polychlorinated biphenyls in the deep sediment of the Indiana Harbor and Ship Canal in East Chicago, Ind.



[This month in EHP](#)

In its annual Children's Health issue, EHP highlights new research into the potential effects of psychological stress on children's response to environmental pollutants.

Inside the Institute



[NIEHS honors staff for years of service](#)

NIEHS/NTP Director Linda Birnbaum, Ph.D., recognized 40 employees, commemorating career milestones of 10, 20, 30, and 40 years of federal service.

Science Notebook



[Upcoming NIEHS workshop on erionite and mesothelioma](#)

NIEHS will host a workshop exploring the state-of-the-science surrounding the mineral erionite and its potential threat to human health Oct. 12 in Rodbell Auditorium.

Calendar of Upcoming Events

- **Oct. 4**, location and time TBA — Combined Federal Campaign (CFC) Kick-off with Charity Fair and Bake Sale
- **Oct. 11-13, (offsite event)**, Center for Veterinary Biologics at the U.S. Department of Agriculture National Centers for Animal Health, Ames, Iowa, 8:00 a.m.-5:00 p.m. — International Workshop on Alternative Methods for Rabies Vaccine Potency Testing: State of the Science and Planning the Way Forward
- **Oct. 12**, in Rodbell C, 11:00 a.m.-12:00 p.m. — Hispanic Heritage Month Celebration, featuring Jane Delgado, Ph.D., of the National Alliance for Hispanic Health
- **Oct. 17-18**, in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. — Board of Scientific Counselors Review of Laboratory of Respiratory Biology
- **Oct. 18**, in Rall D350, 11:00 a.m.-12:00 p.m. — Biostatistics Branch Seminar by Zhigen Zhao, Ph.D., topic TBA
- **Oct. 18, (offsite event)**, in Room 103 of the Bryan Research Building at Duke University, 11:30 a.m.-12:30 p.m. — Neurobiology Invited Seminar Series with Serena Dudek, Ph.D., topic TBA
- **Oct. 24-25, (offsite event)**, at the Hilton Lexington Downtown, Lexington, Ky. — [Superfund Research Program Annual Meeting](#)
- **Oct. 24-26**, in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. — NIEHS/Pan American Health Organization Collaborating Centers Meeting
- **Oct. 25-27**, in Rall Lobby and Keystone Lobby, time TBA — CFC Book, DVD and CD sale
- **Oct. 31**, in Rodbell Auditorium, 11:00 a.m.-12:00 p.m. — Laboratory of Molecular Genetics Fellows Invited Guest Lecture
- **Oct. 31**, in NIEHS Cafeteria, time TBA — CFC Ice Cream Social and Halloween Costume Contest
- View More Events: [NIEHS Public Calendar](#)

Extramural Research

[Extramural papers of the month](#)

- [Carbon nanotubes: Cells bite off more than they can chew](#)
- [Widespread RNA/DNA mismatch](#)
- [Reprogramming adult fibroblasts into functional neurons](#)
- [Mold exposure during infancy increases risk of asthma](#)

Intramural Research

[Intramural papers of the month](#)

- [Neonatal exposure to estrogenic environmental chemicals may contribute to infertility](#)
- [New software analyzes next-generation sequencing data](#)
- [Mitochondrial targeting of phospholipid scramblase 3 depends on palmitoylation](#)
- [COX-2 is a key regulator of Th17 cell differentiation in allergic lung inflammation](#)

NIEHS Spotlight

Zeldin named NIEHS scientific director

NIEHS is pleased to announce that physician-scientist Darryl C. Zeldin, M.D., will become the Institute's new scientific director. Effective Oct. 23, Zeldin will lead and manage a \$114 million biomedical research program focused on discovering how the environment influences human health and disease.

"I can think of no one better suited for this position," said NIEHS/NTP Director Linda Birnbaum, Ph.D. "Darryl is passionate about science, understands the mission of the Institute, and has extensive laboratory and clinical research experience. He has already proven himself to be a leader by establishing our world-class clinical research program." Zeldin has served as the Institute's acting clinical director since 2007, in addition to leading two research groups within the Laboratory of Respiratory Biology, focusing on both basic and clinical translational research.

Zeldin is trained in internal medicine with a subspecialty in pulmonary and critical care medicine. He has spent most of his professional career at NIEHS, arriving in 1994 as a tenure-track investigator before being promoted to a tenured senior investigator in 2001. Zeldin has served in several leadership roles at NIEHS, including representing his fellow scientists as president of the NIEHS Assembly of Scientists, and participating in developing strategic research plans for the division and for NIEHS.

As scientific director, Zeldin will oversee the intramural, or in house, research programs with approximately 950 employees working in 12 different laboratories and branches, and eight core facilities.

"I am both honored and humbled to be selected to lead such an outstanding group of scientists," Zeldin said. "I believe the work we do here at NIEHS is pivotal to improving the overall health of our nation. I'm looking forward to building upon our existing research strengths by using emerging technologies and effective scientific collaboration to develop a cutting edge research program."

Zeldin also said one of his highest priorities as the scientific director will be to recruit and train the next generation of leaders in the field of environmental health sciences. "I will work hard to recruit outstanding tenure-track scientists and to expand our training programs. The future of our country depends on it."

Zeldin earned a B.A. in chemistry from Boston University in 1982 and an M.D. from Indiana University School of Medicine in 1986. He completed a residency in internal medicine at Duke University in 1989 and a fellowship in pulmonary/critical care medicine at Vanderbilt University in 1993. Zeldin is internationally recognized for his contributions to the fields of environmental health, respiratory disease, and cardiovascular disease.

He is a member of the American Society for Clinical Investigation and a fellow in the American College of Chest Physicians and the American Heart Association. He has served on National Institutes of Health and



Zeldin's experience in clinical and basic research at NIEHS is extensive.

foundation study sections and is a member of the editorial boards of several scientific journals. He has published more than 200 peer-reviewed articles in leading biomedical journals, as well as numerous reviews and book chapters. Zeldin is on staff at Duke University Medical Center, where he serves as an attending physician on the pulmonary consult service and the medical intensive care unit.

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NIEHS celebrates Postdoc Appreciation Week

By Eddy Ball

NIEHS joined institutions nationwide Sept. 23, as it paid tribute to its postdoctoral fellows with a celebration on the final day of [National Postdoc Appreciation Week](#). A record number of the Institute's 225 trainees attended an NIEHS Trainees Assembly (NTA) General Assembly meeting in Rodbell Auditorium, followed by a drawing for door prizes, an ice cream and dessert social, and a fun-filled trivia challenge for postdocs and their lead researchers.

At the beginning of their meeting, the Institute's postdocs heard tributes by NIEHS/NTP Director Linda Birnbaum, Ph.D., and Acting Scientific Director David Miller, Ph.D. Birnbaum's words to the trainees set the tone for comments by Miller and, later in the meeting, by Pat Phelps, Ph.D., deputy director of the NIH Office of Intramural Training and Education Graduate Partnerships Program.

"You really make NIEHS who we are," Birnbaum told the audience.

Looking ahead to the 2011-2012 training year

The moderator of the General Assembly meeting, NTA Steering Committee chair Erin Hopper, Ph.D., presented an overview of the role of the NTA at NIEHS and introduced speakers who discussed new developments and upcoming events. Highlights included:

- Planning for the 15th Annual Biomedical Career Fair, scheduled for April 27, 2012 at the U.S. Environmental Protection Agency conference center in Research Triangle Park, N.C. — Planning committee co-chair Darshini Trivedi, Ph.D., said that she and co-chair Ashley Godfrey, Ph.D., are working to integrate even more former trainees into the program to underscore the event's theme for 2012: "Yes, you can still be successful in obtaining a job in this current economy." Career Fair workshops will include converting CVs into high-impact resumes and the K-99 early-career grant pathway.



Competition during the trivia challenge that concluded Postdoc Appreciation Day may have been fierce, but as NIEHS lead researcher Humphrey Yao, Ph.D., shows, the mood was also light, as participants took time out to laugh at themselves. (Photo courtesy of Steve McCaw)



Laughter was contagious, as Trivedi, center, discovered as she joined in the fun with her team mates. (Photo courtesy of Steve McCaw)

- Information about a new brownbag lunch career development series coordinated by NTA Steering Committee co-chair Tammy Collins, Ph.D. — The series features discussions about a different career path each month in an informal question-and-answer setting ([see related story](#)).
- Update on leadership of the NIEHS Office of Fellows' Career Development, following the departure of former Director Diane Klotz, Ph.D. — NIEHS Deputy Scientific Director Bill Schrader, Ph.D., told trainees that his office is striving to get approval for a search for a new director by the end of the 2011 fiscal year. In the meantime, he said, Phelps has accepted a detail to NIEHS for a week each month to support trainees' career development activities.
- Overview of the new [Citizen Schools Program](#), coordinated at NIEHS by the Institute's [Office of Science Education and Diversity](#) — According to Steering Committee member Nisha Cavanaugh, Ph.D., the program will offer postdocs outreach opportunities to participate as environmental health educators in new afterschool programs at two local middle schools.
- Assignment of office and meeting space for the NTA — Miller said he was pleased to announce that the NTA will have space in the main building at NIEHS, room F-182.



Phelps, center, and Cavanaugh, right, bantered as they puzzled over questions. (Photo courtesy of Steve McCaw)

Emerging as a tradition in postdoctoral training at NIEHS and elsewhere

Founded by the [National Postdoctoral Association \(NPA\)](#) in 2009, National Postdoc Appreciation Week was celebrated in 2010 at 87 institutions throughout the U.S. The events are designed to recognize and create awareness of the contributions that postdocs make to the U.S. scientific research enterprise.

At NIEHS, which has long-standing ties to the NPA ([see story](#)), the event has come to mean an afternoon of fun and fellowship with refreshments and prizes made possible by donations from senior scientists. Postdoctoral Appreciation Week is also a time when supervisors and leadership take time to remind their junior colleagues how much the success of the Institute's research program depends on postdocs and to renew their own commitment to offer trainees quality mentoring and a variety of career development experiences that will be useful in a changing job market.

This year's celebration was organized by the NTA National Postdoc Appreciation Day planning committee, which included Hopper, Collins, Cavanaugh, Jim Aloor, Ph.D., Tracy Xu, Ph.D., Stela Palii, Ph.D., and Chaitra Cheluvvaraju, Ph.D.

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Living up to her promise during the General Assembly earlier in the day, Birnbaum, center, joined in the competition with trainees and their group chiefs. NIEHS Associate Director for Management Joellen Austin, left, was on hand to lend her support. (Photo courtesy of Steve McCaw)

Birnbaum addresses ISEE Barcelona

By Eddy Ball

NIEHS/NTP Director Linda Birnbaum, Ph.D., gave a keynote lecture before an international group of researchers at the [annual meeting](#) of the [International Society for Environmental Epidemiology](#) Sept. 13-16 in Barcelona, Spain.

Birnbaum, who is the first toxicologist to head NIEHS, addressed attendees on the final day of the meeting, advocating expanded cross-disciplinary research in a talk titled “How can toxicology inform environmental epidemiology? A new approach to environmental health.”

An integrated approach to environmental health research

Birnbaum opened her talk with her central premise. “The disciplines of environmental epidemiology and toxicology must work closely together,” she said, “on the challenges of addressing human relevance to existing experimental models by sharing techniques and approaches to fill relevant data gaps to improve public health.”

Linking toxicology’s contributions to environmental health science, Birnbaum structured her talk around four important ways toxicology has helped to further environmental epidemiology:

- Provided solid mechanistic evidence to strengthen epidemiologic conclusions
- Helped inform design of epidemiological studies by identifying windows of susceptibility
- Developed new methods to identify interim phenotypes related to biological response to environmental exposures
- Contributed evidence for more complex dose response relationships that explain why various exposures have differing health effects

Bisphenol A research: A model for collaboration

In the course of her talk, Birnbaum referred to a number of examples to support her argument, concluding with what she described as a model for this kind of integrated research, the NIEHS signature program on the health effects of bisphenol A (BPA) to support and integrate human and animal research and determine if exposure to BPA poses a health risk.

According to Birnbaum, this goal is being accomplished by creating a research environment to stimulate collaboration across disciplines and to promote shared resources with the development of reliable and reproducible methods. Ultimately, Birnbaum maintained, NIEHS support should help the two camps of BPA researchers — those involved in guideline studies and those involved in investigator-initiated studies — find common ground. She pointed to the need for replacing what she called a comparison of apples and oranges with more appreciation for what each group’s approach can contribute to understanding of BPA and help fill the gaps in current BPA research.



Birnbaum was one member of an NIEHS delegation of intramural scientists, grant administrators, and grantees who participated in and spoke at the meeting in Barcelona. (Photo courtesy of Steve McCaw)

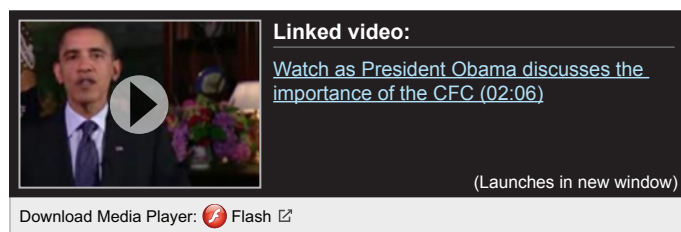
Birnbaum concluded the talk with a brief discussion of the consortium funded by 40 grants from NIEHS to develop hypothesis-driven mechanistic studies of BPA in humans and animals focusing on disease/dysfunction endpoints that can be added to a guideline study. She said the next milestone in the program will be a grantee meeting at NIEHS Jan. 17-19, 2012.

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CFC launches 2011 campaign

By Eddy Ball

NIEHS will kick off its 2011 Combined Federal Campaign (CFC) Oct. 4 with a goal of raising more than \$100,000 in pledges for charitable contributions from employees by the time the campaign closes Dec. 15. The campaign, created by President John F. Kennedy in 1961, celebrates its 50th anniversary this year. CFC supports more than 2,800 local, national, and international approved charities.



CFC chairs at NIEHS, staff scientist Ron Cannon, Ph.D., and biologist Cindy Innes said they hope to both exceed their goal and expand participation in the CFC this year. Last year, the CFC exceeded its goal by raising \$106,944.01, more than \$15,000 greater than the \$91,391.88 achieved in 2009.

NIEHS/NTP Director Linda Birnbaum, Ph.D., urged employees to share in the Institute's tradition of reaching out to help others. "All of us with jobs during this difficult time are very fortunate," she said. "I encourage everyone who gave last year to consider giving more in 2011 and people who have not given in the past to join their colleagues by helping to make a difference by participating in CFC this year."

Although the NIEHS is mid-range in terms of number of employees, compared to other NIH institutes and centers (ICs), Deputy Associate Director for Management Chris Long explained, "We're traditionally in the top third of NIH ICs, in terms of funds raised." Long is serving as chair for the 2011 Greater North Carolina Area CFC's Local Federal Coordinating Committee.

"The Institute has also long been a leader in the multi-agency, regional campaign, the [Greater North Carolina Area CFC](#)," Long continued. "In 2010, our NIEHS contributions made up nearly 10% of the year's entire Greater N.C. Area campaign total."

The Greater North Carolina Area CFC was expanded this year and now encompasses the counties that were previously within the boundaries of the CFC of the Central Carolinas, the Piedmont Triad CFC, the Research Triangle Area CFC, and 18 counties that were not previously associated with a CFC. It now serves over 27,000 federal employees in 56 North Carolina counties and 7 South Carolina counties



*NIEHS CFC co-chair Ron Cannon
(Photo courtesy of Steve McCaw)*

Nationwide, federal civilian, military, and postal employees participating in the CFC gave \$282 million in 2010. Since its inception in 1961, the CFC has raised more than \$6 billion in charitable contributions from federal employees.

How to become a part of CFC

Watch for announcements and plan to attend special events scheduled as a part of CFC at NIEHS:

- Oct. 4 — CFC Kick-off with Charity Fair and Bake Sale
- Oct. 25–27 — Book, DVD and CD sale in 101 Main Lobby and Keystone Main Entry
- Oct. 31 — Ice Cream Social and Halloween Costume Contest
- TBA — Annual Run/Walk Competition with EPA

Make online pledges at the Greater North Carolina CFC Pledge Online page at http://www.cfcgreaternc.org/_root/index.php?content_id=5190 Under the donors pull-down menu at www.cfcgreaternc.org, there is information about approved charities, pledge processing, and frequently asked questions, as well as a printable pledge card that can be used for payroll deductions and one-time cash or check donations.

People who want additional information or help with their pledges can also contact NIEHS CFC division chairs:

- Division of Intramural Research — Bob Petrovich, Ph.D., at 541-4766 or petrovil@niehs.nih.gov
- Division of Extramural Research — Elizabeth Ruben at 541-9470 or rubene@niehs.nih.gov
- National Toxicology Program — Rachel Frawley at 541-2151 or frawleyr@niehs.nih.gov and Eli Ney at 541-5182 or ney@niehs.nih.gov



*NIEHS CFC co-chair Cindy Innes
(Photo courtesy of Steve McCaw)*



*Greater North Carolina Area CFC Local
Federal Coordinating Committee chair
Chris Long (Photo courtesy of Steve McCaw)*

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Council briefed on new developments at NIEHS

By Ernie Hood

There's never a dull moment at NIEHS. That truth was quite evident at the latest meeting of the [National Advisory Environmental Health Sciences Council](#) Sept. 1-2, as members heard updates on a wide variety of recent activities and achievements at NIEHS.

NIEHS/NTP Director Linda Birnbaum, Ph.D., reported on news and highlights from the Institute since the May Council meeting, including the pending appointment of the new NIEHS scientific director. She thanked David Miller, Ph.D., for filling in admirably as acting scientific director for many months while the lengthy search to fill that position was being conducted. Birnbaum also noted the June appointment of Joellen Austin as the new NIEHS executive officer heading the [Office of Management](#).



This was the 134th meeting of the National Advisory Environmental Health Sciences Council, known to people at NIEHS simply as Council. (Photo courtesy of Steve McCaw)

New leadership, new directions

In her debut presentation to Council, Austin reviewed the organization and duties of the Office of Management. "The number one job of the executive officer and, by extension, the Office of Management is to ensure responsible and excellent stewardship and support of the [NIEHS] mission," she said. "Sometimes that means saying no; more often it means finding the creative way to make something happen in support of our mission."

NIEHS Deputy Director Richard Woychik, Ph.D., updated Council on recent developments in the Institute's strategic planning process. The three-day strategic planning stakeholder community workshop held in July ([see story](#)) yielded an enormous amount of material, with 97 breakout sessions spawning [13 priority topics](#) that organizers have since consolidated into eight overarching themes to guide discussions moving forward. Woychik noted that the next step in the 15-month strategic planning process will be the smaller stakeholders workshop scheduled Oct. 13-14.



As she does at every Council meeting, Birnbaum provided Council members with an update on events, activities, and accomplishments at NIEHS/NTP since its last session. (Photo courtesy of Steve McCaw)

NIH DERT Director Gwen Collman, Ph.D., focused much of her presentation on the [NIH Common Fund](#) and the [NIH Blueprint for Neuroscience Research](#), both of which represent major sources of potential funding and collaborations for NIEHS/NTP scientists. The Common Fund is designed to support innovative, creative, and transformative research that transcends the capabilities of any single NIH institute or center.

Among the many [new program ideas](#) currently under consideration is one submitted by NIEHS, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), and several other NIH partners called “Developmental Origins of Health and Disease: Disease Prevention Across Generations,” intended to study the fundamental principle underlying many chronic diseases and conditions in children and adults, including neurodegenerative diseases. NIEHS contribution to the \$40 million neuro blueprint for 2012 will double compared to recent years due to the growth in neuroscience research funding by NIEHS, mainly stemming from increasing interest in early life exposures and neurodevelopment, Collman noted.

Disseminating NIEHS/NTP science

Council members were also updated on recent developments in the [NTP](#) by Associate Director John Bucher, Ph.D., the [Office of Communications and Public Liaison](#) by Director Christine Flowers, and the NIEHS Board of Scientific Counselors (BSC) for the [Division of Intramural Research](#) by chair Jack Keene, Ph.D. of Duke University.

Bucher described the [12th Report on Carcinogens \(RoC\)](#), released June 10. Newly reviewed substances in this RoC include aristolochic acids, captafol, cobalt-tungsten carbide: powders and hard metals, formaldehyde, certain glass wool fibers (inhalable), *ortho*-nitrotoluene, riddelliine, and styrene.

Among the many communications accomplishments reported by Flowers were a well-attended community forum held at NIEHS Aug. 29 to discuss the benefits of investment in federal research that featured Congressman David Price (D-NC), as well as a successful, concerted effort in recent months to increase coverage of the Institute in the local news media.

For the benefit of newer Council members who may have been unfamiliar with the process, Keene outlined the important functions of the BSC, which conducts in-depth reviews of intramural research labs within NIEHS.

The enormous breadth encompassed by the environmental health sciences was on full display in the two absorbing scientific presentations at the meeting ([see related story](#)). There was also considerable interest in a presentation by Seymour Garte of the NIH Center for Scientific Review (CSR), who reported the results of his study of CSR peer review of toxicology and environmental health-related NIH grant applications ([see text box](#)).

(Ernie Hood is a contract writer for the NIEHS Office of Communications and Public Liaison.)



The NIEHS strategic planning process is progressing well, according to Woychik, with eight overarching themes poised to guide discussions at the next stakeholders workshop, to be held this month in Research Triangle Park, N.C. (Photo courtesy of Steve McCaw)



Austin appeared before Council for the first time. She reported excellent progress in learning names and faces around the Institute, and said she is slowly but surely learning her way around the Triangle. (Photo courtesy of Steve McCaw)



Collman briefed Council members on the activities and organization of the NIH Common Fund. (Photo courtesy of Steve McCaw)



Garte had good news for toxicology and EHS researchers. He reported that their concerns about the NIH review process are being addressed and the situation is improving. (Photo courtesy of Steve McCaw)



Flowers, at the podium, right, shared several recent video clips produced by her staff. The clip on the screen featured NIEHS research fellow Jessica Williams, Ph.D., discussing new findings about DNA replication stability. (Photo courtesy of Steve McCaw)



Shown left to right, ex-officio Council member Deborah Winn, Ph.D., of the National Cancer Institute, discussed a point with members Julia Brody, Ph.D., of the Silent Spring Institute, and Andrea Hricko, of the Keck School of Medicine at the University of Southern California. (Photo courtesy of Steve McCaw)

Changes at CSR bring more balance for tox and EHS Applications

In recent years, there has been concern within the toxicology and environmental health sciences (EHS) communities that NIH grant applications from the fields were not being reviewed to their best advantage, because they were spread throughout the NIH [Center for Scientific Review \(CSR\)](#), rather than going to study sections with specific expertise, as had been the case with toxicology applications in the past. Some applicants felt that since the study sections were reorganized in 2004, toxicology and EHS have not had a natural home within CSR, and approval rates have suffered as a result.

Responding to this concern, CSR established a test Special Emphasis Panel (SEP) called Systemic Injury from Environmental Exposure (SIEE), which was to run for three funding rounds and then be evaluated. By 2009, it had been determined that SIEE was not significantly improving the situation.

Seymour “Sy” Garte, Ph.D., director of the Division of Physiological and Pathological Science at CSR and a former environmental health researcher himself, reported to Council on the results of his study of the situation and more recent actions put in place to address it. The SIEE has been eliminated, and now four study sections have been identified as targets for toxicology and EHS applications:

- [Xenobiotic and Nutrient Disposition and Action \(XNDA\)](#)
- [Innate Immunity and Inflammation \(III\)](#)
- [Integrative and Clinical Endocrinology and Reproduction \(ICER\)](#)
- [Lung Injury, Repair, and Remodeling \(LIRR\)](#)

Garte noted that new CSR guidelines specifically include toxicology, and that reviewers and chairs with toxicology and EHS experience have been recruited to sit on the targeted study sections. He presented data that showed that since those changes have been made, toxicological and EHS applications reviewed by the targeted study sections have been scored more favorably. In the future, he said, there are plans to increase the flow of toxicology and EHS applications to the targeted study sections, to continue to recruit expert reviewers for those study sections, to consider additional or different target study sections, and perhaps even to revisit the concept of an SEP devoted to EHS.

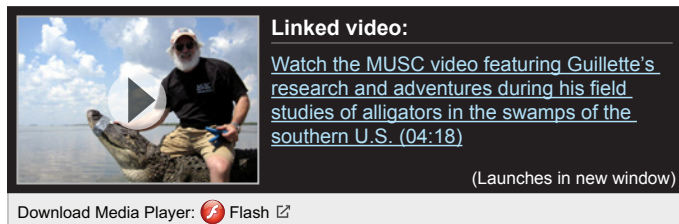
Garte added that the new acting director of CSR, Richard Nakamura, Ph.D., has indicated he is open to hearing new ideas and input from the EHS community. Garte encouraged members of the community to communicate their thoughts with Nakamura and CSR at this time.

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Guillette honored by Heinz Foundation

By Eddy Ball

Former NIEHS grantee Louis Guillette, Ph.D., became the latest in a long list of NIEHS-funded environmental health scientists to receive the coveted \$100,000 [Heinz Award](#), when Teresa Heinz and the Heinz Family Foundation announced winners of the 17th annual Heinz Awards Sept. 13. The foundation cited Guillette's pioneering research for offering insight into the impact of toxic chemicals on wildlife and human health.



“Dr. Guillette’s work has focused on the important field of endocrine disruption,” Teresa Heinz, chairman of the Heinz Family Foundation, said in the Foundation’s [press release](#) announcing Guillette’s award. “His research on alligators and other marine life created an in-depth model for understanding the effects of toxins in the wild and provides information we need to safeguard people and wildlife.”

NIEHS support for research into endocrine disruption

[Guillette](#), who is currently a professor of obstetrics and gynecology and holds an endowed chair in the [Marine Genomics Center of Economic Excellence](#) at the Medical University of South Carolina (MUSC), received NIEHS funding during his tenure as a professor at the University of Florida. NIEHS support for Guillette’s research in fiscal years 2006 and 2007 resulted in some 15 grant-funded [publications](#) on reptilian endocrine systems and endocrine disrupting compounds (read a Public Broadcasting System Frontline [interview](#) with Gillette about his work).

Guillette’s grant administrator at NIEHS was Jerry Heindel, Ph.D. When he learned of the award, Heindel said of his colleague, “Lou is the perfect choice for this award. It recognizes his groundbreaking work providing solid scientific support for the hypothesis concerning endocrine disruption, focusing on alligators and other reptiles, but always working to translate the information across species including humans. He is unique — who else could hold joint appointments in a marine genomics center and the department of obstetrics and gynecology?”

Heindel also observed that while Guillette personally had only one NIEHS grant, he has worked diligently to stimulate research into endocrine disruption, in general, and mentored many scientists who continue working in the field of environmental health sciences.

The latest honor in a distinguished career in science

As part of a prestigious Howard Hughes Medical Institute professorship from 2006 to 2010, Guillette started the [G.A.T.O.R. \(Group Advantaged Training Research\)](#) program, which brings together graduate and undergraduate students to work together in research teams, under the guidance of faculty advisors. Guillette is a fellow of the



Guillette has said of his mantra about field studies with reptiles, “If the environment is healthy for them, it’s healthy for us... We study the alligator as a sentinel species for ecosystem health and to give us warning if there is potential danger to humans working in the area.” (Photo courtesy of the Heinz Foundation)

American Association for the Advancement of Science (AAAS) and has received honorary professorships from institutions in Japan, the Philippines, South Africa, and South America. Prior to his appointment at MUSC in 2010, Guillette was a distinguished professor of biology at the University of Florida.

Now in their 17th year, the Heinz Awards honor visionaries who have made extraordinary contributions to the environment, a life-long area of commitment for the late U.S. Senator John Heinz. Guillette and eight others are recognized in 2011 for their significant efforts benefitting the environment. This year's awards total \$900,000.

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NIEHS launches GuLF STUDY media tour

By Eddy Ball

As part of the effort to recruit 55,000 people for the massive [GuLF STUDY \(Gulf Long-term Follow-up Study\)](#), NIEHS conducted the first of four fall media tours Aug. 31-Sept. 1 in southern Alabama. During the visit, NIEHS representatives reached out to residents and potential study participants at seven community meetings, distributed printed materials, and conducted interviews with local reporters for print, radio, and broadcast media, blanketing a shared media market stretching from Pensacola, Fla. to Pascagoula, Miss.

The GuLF STUDY is a health study for workers and volunteers who helped clean up after the Deepwater Horizon oil spill disaster.

Led by NIEHS epidemiologists Dale Sandler, Ph.D., and Richard Kwok, Ph.D., the NIEHS contingent traveled along the shores of Mobile Bay, Ala., with stops in Mobile, Theodore, Irvington, and Bayou La Batre on the Mississippi side of the bay, as well as in Fairhope and Gulf Shores on the Florida side.

“We are studying a wide range of health problems that concern the community, including both physical and mental health,” Sandler said. “The health problems we are studying range from breathing problems, skin conditions, and high blood pressure, to heart attacks and cancer. We are also studying mental health problems such as depression, stress, and anxiety.”

“We’re conducting this comprehensive communications effort to make sure as many people as possible know about the GuLF STUDY and how to join,” explained NIEHS Director of Communications and Public Liaison Christine Flowers.

Communication increases interest

In the course of their 30-hour visit, NIEHS representatives were successful in raising public awareness and interest in the study.

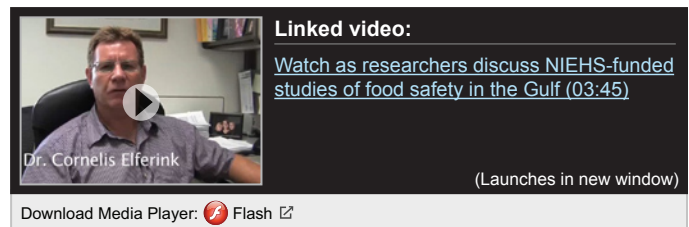


- The GuLF STUDY telephone research center received 104 calls in the timeframe immediately before, during, and after the tour.
- Three community meetings prompted 117 people to sign up for the study.
- Five community leader briefings garnered support from 63 influential grass-roots organizers and local government officials who will serve as community ambassadors for the GuLF STUDY.
- 50 media placements resulted in more than 1.6 million impressions.
- 1,800 flyers, 1,000 brochures, and 500 posters were distributed.

The GuLF STUDY has recruited more than 2,800 clean-up workers so far.

Going forward

The GuLF STUDY team has tentatively scheduled the next tour stop in New Orleans for late October, with a similar strategy for informing the public about the GuLF STUDY and related studies by grantees at area universities in the western end of the affected area. Other tours are planned for Mississippi and Florida.



Participants complete a survey over the phone and then get a medical exam that collects blood, urine, and other samples. Participation in the GuLF STUDY is confidential.

Gulf residents interested in learning more about becoming a part of this historic study should call toll free 1-855-NIH-GuLF (1-855-644-4853) or visit the study website at www.nihgulfstudy.org.

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NRC report offers lawmakers new approach for health impact assessment

By Ian Thomas

In a new report, co-sponsored by NIEHS, the National Research Council (NRC) introduced a comprehensive, six-step framework for assessing the potential health impact of new policies, plans, and projects. While other incarnations of such a process have been utilized in the past, the one proposed in the [NRC report](#), titled “Improving Health in the United States: The Role of Health Impact Assessment,” provides guidance that is unique for its flexibility of application, integration of multiple risk factors, and applicability in both the public and private sectors.

“Health impact assessment is an important addition to the public health toolbox,” said [John Balbus, M.D.](#), senior advisor for public health at NIEHS. “By taking into account a variety of diverse factors, such as environmental exposures, pollutants, nutrition,



Balbus is the NIEHS lead on a number of global and domestic public health initiatives. (Photo courtesy of Steve McCaw)

physical activity, and mental health, among others, this assessment model offers public health officials a holistic approach that identifies both the risks and rewards associated with a given policy, law or project.”

Comprised of six key steps, a health impact assessment begins by screening a policy to determine the scope and overall necessity of its application. Next, it identifies what populations would be affected and how. From there, the assessment evaluates the beneficial and adverse health effects of the policy, and compiles recommendations for dealing with both. Finally, these recommendations are reported to lawmakers and the public, and policy effectiveness is monitored after implementation. Still, as much potential as this model has for enhancing public health, Balbus admits that it’s not without its detractors.

“Conducting health impact assessment does require some investment of time, personnel, and financial resources,” he explained. “In the setting of local infrastructure projects, the perception is that this type of in-depth, methodical process only leads to more delays and increased costs. Changing such a perception will require greater education on the part of decision-makers and stakeholders, plus additional training for experts to ensure that these assessments are performed correctly and with maximum results.”

While the framework proposed in this report is merely the first step in promoting such a concept to government and community officials, Balbus agrees that factoring health and related costs into major decisions must always be taken into account.

“The NRC report provides a number of recommendations for additional research and education on this subject, many of which NIEHS will have a strong role in addressing,” Balbus concluded. “Finding new ways to get communities, stakeholders, and individuals engaged in the decision-making process is crucial in addressing issues of public health and social justice. Ultimately, health impact assessment provides a more accessible means by which everyone involved can do just that.”

(Ian Thomas is a public affairs specialist in the NIEHS Office of Communications and Public Liaison.)

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Superfund signs Memorandum of Understanding with EPA

By Rebecca Wilson

NIEHS [Superfund Research Program \(SRP\)](#) staff announced in September that a long-awaited Memorandum of Understanding (MOU) has been finalized between NIEHS and the U.S. Environmental Protection Agency (EPA). This MOU formalizes an agreement between the SRP and the [EPA Office of Superfund Remediation and Technology Innovation \(OSRTI\)](#), the office responsible for overseeing the cleanup of Superfund sites.

The MOU was confirmed with signatures from NIEHS/NTP Director Linda Birnbaum, Ph.D., and OSRTI Director James Woolford. “The SRP has been working with this office in the EPA for the past 17 years,” said Beth Anderson, program analyst for the SRP. “[Our association] has evolved over time, and we now enjoy a robust partnership. This MOU demonstrates our commitment to future collaboration.”

Technical transfer of SRP research to application at Superfund sites

According to the MOU, the goal of the agreement is to foster an environment that “promotes the utilization of the research outcomes and knowledge to better serve the nation’s environment and human health.” The MOU will enhance collaboration and coordination between the two agency offices, by smoothing the path for technical transfer of research products from the SRP to OSRTI.

To accomplish these goals, OSRTI and SRP have several activities planned. Routine conference calls are being held to exchange information on emerging needs and recent accomplishments, as well as ways to mesh research strategies with Superfund needs. The two agencies are also developing a cross-agency research topic matrix that will compile and summarize recently completed research that can be applied to hazardous waste cleanup.

The ongoing collaboration between SRP and OSRTI also addresses the important issue of responsibly using funding dollars. “It’s important for us to work together,” said Anderson. “Our grantees research solutions to real, complex problems. Their results should be applied in the field.” SRP and OSRTI intend to match completed research to Superfund sites with relevant problems that may benefit from the solutions offered by research.

OSRTI is located within the EPA Office of Solid Waste and Emergency Response. In addition to site cleanups, it is responsible for promoting new technology and approaches to managing sites and providing technical assistance, expertise, and support in responding to environmental emergencies and terrorist events.

(Rebecca Wilson is an environmental health information specialist with MDB, Inc., a contractor for the NIEHS Superfund Research Program and Worker Education and Training Program.)

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Woychik addresses NY Committee for Occupational Safety and Health

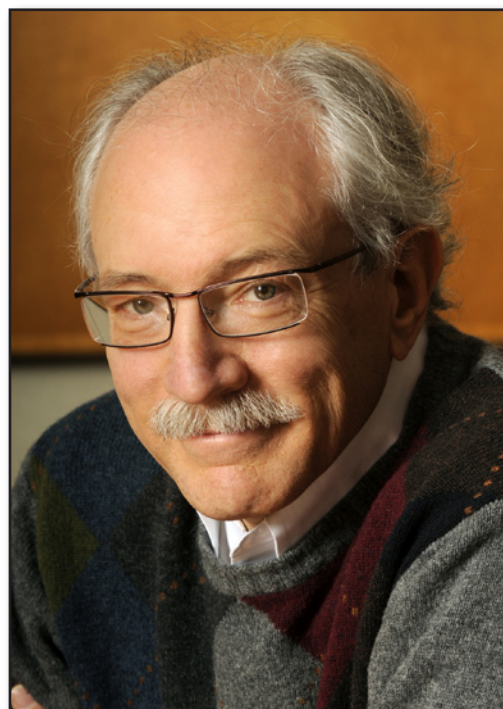
By Eddy Ball

NIEHS Deputy Director [Rick Woychik, Ph.D.](#), was an invited speaker at the [New York Committee for Occupational Safety and Health \(NYCOSH\)](#) conference Sept. 16 in New York City, themed “Protecting Worker and Community Health: Are We Prepared for the Next 911?”

Along with pointing to the role of NIEHS in the aftermath of the World Trade Center attacks (WTC), Woychik expressed condolences to survivors and emphasized the importance of maintaining the financial and human resources needed for immediate response to future disasters. “As we learned during the 9/11 response, and more recently in the Gulf oil spill response,” he maintained, “it is critical to establish funding mechanisms to support a rapid and robust scientific response to disasters.”

In addition to Woychik and several other congressional, academic, medical, and first responder representatives, the conference featured speakers from three other major federal agencies that had responsibility at the WTC site:

- [John Howard, M.D.](#), WTC Health Program administrator and director of the National Institute for Occupational Safety and Health (NIOSH)
- [David Michaels, Ph.D.](#), assistant secretary of labor for occupational safety and health at the Occupational Safety and Health Administration (OSHA)



Looking ahead, Woychik assured his audience that NIEHS is poised to respond. “NIEHS, along with its academic research centers and other partners, stands ready to carry forward the lessons of 9/11 in assuring public health protections, top-notch scientific research, and clear evidence-based health communications for responders and their communities.”
(Photo courtesy of Rick Woychik)

- [Mathy Stanislaus, J.D.](#), assistant administrator for the U. S. Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response

NIEHS support for WTC-related health effects

In his presentation, Woychik spoke proudly of the rapid response by the NIEHS Worker Education and Training Program (WETP) following the attack on Sept. 11, 2001. He noted action by WETP to provide immediate supplemental funding for universities, unions, and community groups to support site worker safety training, the provision of respirators and fit testing, initiation of direct worker exposure monitoring, and technical consultation on the development of a site safety plan for workers clearing the enormous pile of debris at Ground Zero.

Woychik described the success of WETP in completing the first comprehensive safety and health training assessment of site hazards and risks during the third week of September 2001, which laid the basis for a subsequent safety-awareness training program for the more than 7,000 workers who participated in the WTC cleanup. He also discussed ongoing academic research efforts launched soon after 9/11 and funded by NIEHS that, among other accomplishments, led to the identification and characterization of the World Trade Center cough, its associated symptoms, and duration of the condition.

Forewarned should be forearmed

As effectively as responders performed after 9/11, especially considering no one had anticipated a disaster of that magnitude, Woychik argued, the WTC should serve as a warning for agencies to prepare responses to such large-scale disasters in the future well before they occur.

These responses, Woychik continued, should strive to integrate individuals and communities affected by a disaster as full partners in scientific investigations related to the disaster; to standardize approaches to data collection and sharing by federal, state, and local response organizations; and to identify, develop, deploy, and maintain new information technology for collecting data in the field.

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Olden honored at environmental public health conference

By Linh Pham

Former NIEHS Director Kenneth Olden, Ph.D., received the 2011 Richard and Barbara Hansen Leadership Award and Distinguished Lectureship Sept. 8 from the University of Iowa (UI) College of Public Health. This annual award honors individuals who have demonstrated exemplary leadership and sustained contributions in the health field. Presenter Sue Curry, Ph.D., dean of the UI College of Public Health, noted, “Dr. Olden is a long-time champion of community participation in the full spectrum of environmental health research.”

Olden, an advocate for environmental justice and community-engaged research since the 1990s, gave the keynote address before a standing-room-only audience at the [Engaging Communities to Advance Environmental Health Policy](#) conference held Sept. 7-8 at UI. According to NIEHS Program Analysts Beth Anderson and Liam O’Fallon, this conference included energetic presentations and round-table discussions during the Partnerships for Environmental Public Health (PEPH) workshop on engaging policy- and decision-makers, with panel discussions on the important contributions of community-engaged research, and talks about rural environmental issues at the National Workshop and Environmental Justice Listening Session.

Hansen Award recipients are selected based on sustained and nationally recognized excellence, vision and ability to inspire others, and significant contributions to improving public health. In addition to receiving the award and delivering the keynote lecture, Olden also spent the day interacting with the extended UI community, students, and outside groups in seminars, small group activities, and other UI campus events.

Olden comes full circle with environmental justice advocacy

Olden is currently professor and founding dean of the City University of New York School of Public Health. During his tenure as NIEHS director, Olden promoted public health, community-based participatory research, children's health, and environmental justice. According to the University of Iowa [press release](#) about the award, "[Olden positioned] the institute to play an increasingly important role, as public policy makers seek to balance human health needs with the economic benefits of commercial processes that might endanger that health."

In his leadership of both NIEHS and the National Toxicology Program, Olden moved towards integrating basic research and toxicology with public health and environmental justice initiatives. Anderson stressed that a poignant aspect of this meeting was that it highlighted the products of Olden's efforts to promote environmental public health. "Dr. Olden was instrumental for supporting the programs that are now a part of PEPH. At this meeting, he was able to interact with PEPH grantees, observe environmental justice issues receiving federal priority again, and participate in the Environmental Justice Listening Session."

Environmental factors may be more influential than genetics

During his presentation, Olden stressed, "The environment is extremely important to your health – possibly more important than genetics." He advocated a new model for research that is more focused on epigenetics, the study of heritable changes in gene expression caused by structural changes rather than the underlying genetic sequence.

O'Fallon noted of Olden's unique perspective, "There is a mismatch between the environment and genetics. The environment is changing faster than our genomes can adapt." According to Olden, the genetic sequence of an individual remains mostly unchanged throughout life, whereas the epigenome changes in response to environmental exposures such as pesticides, diet, stress, and many other factors. Olden concluded,



Curry, left, and Richard Hansen, right, presented Olden with the Hansen Leadership Award and Distinguished Lectureship. Made possible by a gift from Hansen and his wife, Barbara, this annual award is given to individuals exhibiting exemplary leadership and dedication to public health. (Photo courtesy of the UI College of Public Health)



According to O'Fallon, right, a recurring theme for advancing environmental health policy is connecting scientific data with stories from the rural community. "To be effective, you have to put a face to the science," he emphasized. (Photo courtesy of Justin Crane)

“Understanding the role of epigenetic mechanisms in human health and disease is one of the highest priorities in medical research.”



In addition to Anderson and O’Fallon, NIEHS representatives Claudia Thompson, Ph.D., second from right, and Kristianna Pettibone, Ph.D., not shown, were also in attendance, along with 25 grantees who are part of PEPH. The overarching goal of this conference was to encourage policy and decision makers to develop strategies for engaging local communities and policy makers to improve environmental health. (Photo courtesy of Justin Crane)



“The strength of this conference was the engaging presentations followed by very participatory round table discussions,” Anderson explained. The breakout sessions were focused on decision-making processes at the level of state government and comparing environmental health mobilization in urban versus rural settings. (Photo courtesy of Justin Crane)

(Linh Pham, Ph.D., is on detail as a program analyst in the NIEHS Division of Extramural Research and Training.)

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Cavanaugh and Wilson group paper highlighted by JBC

By Eddy Ball

The Sept. 9 issue of the Journal of Biological Chemistry (JBC) showcases the issue’s paper of the week, from the NIEHS [DNA Repair and Nucleic Acid Enzymology Group](#), with a cover illustration featuring an x-ray crystallographic image from the paper and a [profile](#) of its first author, postdoctoral fellow Nisha Cavanaugh, Ph.D.

JBC associate editors and editorial board members bestow the honor of [paper of the week](#) to the top one percent of papers reviewed in terms of significance and overall importance, according to the JBC website. JBC is the most cited journal in biomedical research, publishing some 38,000 pages of new research each year as well as enjoying an impact factor of 5.328 and the highest overall importance [eigenfactor score](#) of any journal in its category.

A multifaceted approach

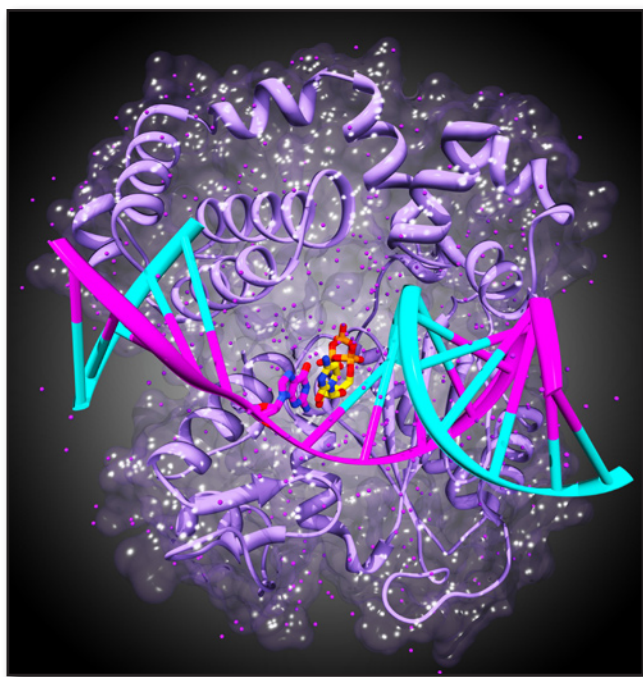
The DNA Repair and Nucleic Acid Enzymology Group is headed by senior researcher [Samuel Wilson, M.D.](#), who was lead researcher on the paper ([see story](#)), and is part of the NIEHS Laboratory of Structural Biology (LSB).

As Wilson explained, the study resulted from a multifaceted approach toward understanding the enzyme DNA polymerase (pol) beta that involved a collaborative effort between members of his own group —William Beard, Ph.D., Vinod Batra, Ph.D., Cavanaugh, and David Shock — and members of the LSB [Computational Chemistry and Molecular Modeling Group](#) — head [Lee Pedersen, Ph.D.](#), and Lalith Perera, Ph.D.

In the JBC author profile, Cavanaugh pointed to the primary components of the team's approach, stating, "In this study, we build on our previous work and use four different methods — site-directed mutagenesis, kinetics, x-ray crystallography, and computational modeling — to examine how pol beta excludes ribonucleotides from its active site."

In the course of her scientific training at the University of Colorado at Boulder and NIEHS, Cavanaugh has been a coauthor on eight peer-reviewed publications, four of them since joining the Wilson group in 2009. Three of them have appeared in JBC, another four were published in Biochemistry, and one appeared in Cellular and Molecular Life Sciences.

Citation: [Cavanaugh NA, Beard WA, Batra VK, Perera L, Pedersen LG, Wilson SH](#). 2011. Molecular insights into DNA polymerase deterrents for ribonucleotide insertion. *J Biol Chem* 286(36): 31650-31660.



The cover image for JBC issue shows a crystal structure of DNA polymerase beta bound with gapped DNA and a ribonucleoside triphosphate. The structure reveals that ribonucleotides are accommodated in the active site. DNA pol beta employs two strategies, steric and geometric, with a single protein residue to deter ribonucleotide insertion. (Image courtesy of the NIEHS DNA Repair and Nucleic Acid Enzymology Group and JBC)



Along with her research in structural biology, Cavanaugh is a member of the NIEHS Trainees Assembly Steering Committee. (Photo courtesy of Steve McCaw)



In his roles as a leader and researcher at NIEHS, Wilson has long championed research on the role of DNA pol beta in DNA repair and replication. (Photo courtesy of Steve McCaw)

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Writer and editor kick off trainees' brown bag lunch series

By Jeffrey Stumpf

The NIEHS Trainees Assembly (NTA) kicked off its new series of career-development brown bag lunches Sept. 9 with a session on scientific writing opportunities. Two professionals in the science writing and editing fields, Laura Stemmle, Ph.D., and former NIEHS postdoc Sophie Bolick, Ph.D., discussed life in the communications industry, before a capacity audience of postdoctoral fellows during the inaugural session.

The lunch series was initiated by the NTA Steering Committee to highlight careers for trainees in all areas of science. Tammy Collins, Ph.D., an IRTA fellow in the Laboratory of Molecular Genetics, heads the committee that schedules the series' speakers and moderates meetings. The steering committee recognized a demand among postdocs for information about a variety of science careers, which Collins said the group hopes to meet.

"There is not an academic [research] job for everyone," Collins commented. "We need additional ways for postdocs to learn what is out there and marketable, even if it is not working on the bench."

An intimate setting conducive to networking

The lunch series will meet in the executive conference room on the second Friday of every month at least until April 2012, excluding federal holidays (see [text box](#)). The topics for discussion include careers in academia, industry, and policy. IRTA fellow Jill Hesse, Ph.D., noted that the intimate setting provides an opportunity for engagement by trainees that would be difficult in a large seminar.

"The lunch provides a forum for the fellows to ask questions and really get a sense of what is required day to day," Hesse remarked.

Like any career planning event, Collins believes the ultimate prize for attending the lunch series is building that all-important network. "Every time we bring someone here, it's a chance to meet local people who may be able to help with job openings," Collins explained.

Transitioning from bench to communications

Stemmle and Bolick both told stories of leaving bench science behind for a career in science communications. For Bolick, who wrote for the Environmental Factor and Environmental Health Perspectives during her training at NIEHS, the transition from NIEHS to her medical writing position at [MedThink Communications](#) was not difficult.

Changing careers to science writing involved developing a different intellectual skill set than research scientists generally use. Bolick said she found that writing about a variety of different subjects, in short time spans, required broadening her interests. "As a postdoc, I knew a lot about a narrow subject," Bolick recalled. "Now, I know a little about a wide variety of topics."



According to Bolick, medical writers for MedThink Communications have to write quickly and efficiently but, unlike postdocs, rarely have to take their work home. (Photo courtesy of Steve McCaw)



Stemmle works mostly from home, but spoke about the fun, coffee-shop style office where she and other telecommuters meet regularly. As a booming company, she said, "AJE always has open positions for people with Ph.D.s in science to become managing editors. (Photo courtesy of Laura Stemmle)

“I’m glad I don’t have to hold a pipette anymore,” joked Bolick. “But you have to want to write, to take this job.”

Stemmler, a general manager of author services at [American Journal Experts \(AJE\)](#), provided a different perspective on medical communications. In contrast to a fixed work schedule with time sheets, Stemmler talked about the freedom of telecommuting from home, accompanied by potentially odd working hours and a self-professed addiction to email. “I’m glad to be able to maintain a balance between work and family,” Stemmler reflected.

AJE provides an editing service, mainly for scientists who are not native English speakers. Stemmler believes in the mission of helping improve the language of a manuscript, so that it is properly judged only on its scientific merit.

“When you read a paper that is not written well, it’s easy to throw out the data,” Stemmler explained.

(Jeffrey Stumpf, Ph.D., is a postdoctoral fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)



In addition to her work in the Mitochondrial DNA Replication Group, Collins organized the brown bag lunch career series for postdocs — not only to learn about what careers are marketable, but also to understand different professional cultures. (Photo courtesy of Steve McCaw)

The series of informal discussions continues

On the second Friday of each month, the brown bag lunch series will highlight a different set of Ph.D. careers to provide fellows the opportunity to meet with individuals with firsthand experience in them. At least one speaker will be more seasoned and will comment on careers in that field, while another speaker will discuss the transition from postdoc to the career. In contrast to typical career fairs, the lunch will provide an informal and more intimate atmosphere for postdocs to ask questions and hear more about the career path.

Brown Bag lunch series schedule:

Date	Host	Topic
10/14/2011	Abee Boyles, Ph.D.	Science Policy
11/18/2011	Darshini Trivedi, Ph.D.	Industry, Research
12/09/2011	Nisha Cavanaugh, Ph.D.	Academia, Teaching
01/13/2012	Tammy Collins, Ph.D.	Academic, Administration
02/10/2012	Darshini Trivedi, Ph.D.	Nonprofits
03/09/2012	Bhargavi Rao, Ph.D.	Regulatory Affairs
04/13/2012	Chaitra Cheluvvaraju, Ph.D.	Industry, Non-research



Like many other postdocs, Hesse is interested in learning about careers beyond the postdoc experience. (Photo courtesy of Steve McCaw)

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LSB fellow makes move to private sector

By Sindura Ganapathi

This summer, Intramural Research and Training Award (IRTA) fellow Kelly Mercier, Ph.D., made a major transition in her career, from being a trainee in the NIEHS Laboratory of Structural Biology (LSB) Nuclear Magnetic Resonance (NMR) Group, to a position as an applications scientist at the private-sector diagnostic company [LipoScience](#). Just as Mercier had hoped, the geographical relocation to northwest Raleigh was less significant than the move from public-sector to private-sector employment.

At NIEHS, Kelly worked with NMR Group head Robert London, Ph.D., predicting functions of proteins and protein domains with unknown function through ligand-binding studies using NMR spectroscopy.

“The career transition certainly wasn’t easy or quick,” Mercier said. It required all the elements that are stressed at career fairs — networking, persistence, careful planning, and a healthy measure of luck.

Networking was the key for Mercier

Meeting new people and keeping in touch with them played a very big part in Mercier’s job search. She had applied for a position with Thomas O’Connell, Ph.D., at The Hamner Institutes for Health Sciences, and she’d been tentatively accepted as well. However, in the interim, O’Connell moved to LipoScience, and the job she’d almost had at Hamner was gone.

Mercier then began following opportunities at LipoScience and, when a suitable job opened up, she contacted O’Connell. “The rest was really the easy part,” she explained. “Before long, I had a job offer from LipoScience.”

LipoScience is a medical technology company that specializes in clinical applications, such as plasma lipid profiling using NMR spectroscopy. In her position there, Mercier will apply her Ph.D. work and training at NIEHS in the development of a new proprietary method for using NMR in clinical diagnosis.

“It’s very challenging and interesting to do the groundwork, in a company, for a new method with the market in mind,” Mercier said. She added that she is very pleased with the work-life balance in her new role and is enjoying the close-knit working environment of a small company.

Cultivating relationships, old and new

In addition to her lab work at NIEHS, Mercier was very active in the scientific society [Graduate Women in Science \(GWIS\)](#), serving as secretary and, subsequently, as president of the group’s Triangle-area Rho Tau chapter. In the midst of her professional transition, Mercier was elected as the national GWIS treasurer, where she now manages the operating budget and numerous endowments. She also participated in many workshops and career fairs at NIEHS and made contacts during these meetings that proved to be very helpful.



Mercier is a good example of the importance of connecting with others in successful career development. (Photo courtesy of Steve McCaw)

Mercier used a very open approach in her job search and networking. She kept in touch and sought advice from her Ph.D. supervisor at the University of Nebraska–Lincoln, [Robert Powers, Ph.D.](#), who had prior industry experience. She also complemented her LinkedIn profile with many highly positive recommendations from her colleagues, highlighting her teamwork skills.

“Keeping everyone informed that you are looking for a job is very important,” Mercier noted. She gave an example from her own experience. She made an effort to forward job openings she came across to friends who were also on the job hunt, and one of them landed a director’s position from one of Mercier’s leads.

“It doesn’t hurt to have a friend who is a director and who owes you one,” Mercier added with a laugh.

(Sindura Ganapathi, D.V.M., Ph.D., is an IRTA fellow in the NIEHS Laboratory of Signal Transduction Inositol Signaling Group.)

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Gottesman announces new intramural research website

By Robin Arnette

On September 19, [Michael Gottesman, M.D.](#), deputy director of the Intramural Research Program (IRP) at the National Institutes of Health (NIH) announced the launch of a new [website](#) that unifies all of the outstanding work conducted by NIH in-house researchers. This latest NIH presence on the web seeks to educate the general public about the biomedical and behavioral research that takes place in the intramural program, stimulate novel research collaborations, and highlight the numerous employment and training opportunities available for scientists outside of NIH.

The website is the culmination of the I Am Intramural campaign, a project developed by NIH intramural scientific directors to spread the word about the intramural program. Gottesman was one of the major promoters of the venture and said that the website is the perfect vehicle for his office.

“This is a proud, shining face,” Gottesman said. “The larger scientific community [and others] need to know who we are and what we do.”

It took an 80-member group two years to complete the website. The effort was led by L. Michelle Bennett, Ph.D., from the National Heart, Lung, and Blood Institute; Andreas Baxevanis, Ph.D., from the National Human Genome Research Institute; and Christopher Wanjek, director of communications for the NIH Office of Intramural Research. Since the website was a trans-NIH endeavor from the beginning, its design reflects that approach. The research section is organized by focus area, rather than by institute, while the research in action portion includes regularly updated articles about labs and researchers from throughout the IRP. The website has links to [The NIH Catalyst](#), the official newsletter for intramural research, and social media links, such as Facebook, LinkedIn, Twitter, and others. It also has sections on intramural news releases, careers, and training positions.



Gottesman said that the idea for an intramural website came from a scientific directors’ retreat held in December 2008. (Photo courtesy of NIH)

The team worked many hours to make the website a reality, and Bennett is pleased with the final product. When asked how she felt to finally unveil the website, she said, “We are extremely excited about the launch of this site that reflects input from scientists, clinicians, communications and training directors, technology transfer and IT specialists, administrators, and support staff.”

Baxevanis was also satisfied with the website and said he’s gotten good reviews. “The initial response to the new website by the NIH community has been incredibly positive,” he added. “It’s been quite heartening to see the community come together around this effort.”

The NIH IRP is made up of approximately 1,100 tenured or tenure-track scientists and thousands of postdoctoral fellows and staff. Since NIH’s humble beginnings in a one-room laboratory in 1887, intramural researchers have been responsible for a number of public health advances, ranging from the use of fluoride to prevent tooth decay to the development of the first AIDS drugs. Knowing the program’s history certainly makes the website’s homepage title a fitting one — “The NIH Intramural Research Program: Our Research Changes Lives.”



During the launch of the I Am Intramural campaign in July 2009 ([see story](#)), NIEHS handed out coffee mugs to promote the intramural program. (Photo courtesy of Steve McCaw)



Screenshot of the IRP homepage (Graphic courtesy of Christopher Wanjek)

Science Notebook

Council scientific talks showcase diverse research interests

By Ashley Godfrey

Two scientific presentations at the 134th meeting of the National Advisory Environmental Health Sciences Council Sept. 2 highlighted the vast range of the research interests supported by NIEHS. Jerrel Yakel, Ph.D., head of the [Ion Channel Physiology Group](#) in the NIEHS Laboratory of Neurobiology, and [Sarah Tishkoff, Ph.D.](#), an NIEHS grantee at the University of Pennsylvania, treated listeners to reports on cutting-edge research, ranging from the study of nicotinic acetylcholine receptors (nAChRs) in the mammalian brain to human evolutionary genetics in African populations.

Yakel — “Nicotinic Acetylcholine Receptor Function in the Brain: Role in Synaptic Excitability, Plasticity, and Disease”

In his talk, Yakel explained why understanding how nAChRs function in the brain is so important. These receptors are widespread throughout critical regions of the brain and deficits in nAChR signaling are associated with neurodegenerative diseases, such as Alzheimer’s and Parkinson’s disease.

Through a combination of techniques, such as electrophysiology, measuring the electric current released by receptor activation, and Voltage Sensitive Dye (VSD) imaging, an optical method of measuring receptor activation, Yakel is able to map the location of these receptors in the mammalian brain more precisely and gather information about how activation of this type of receptor can affect the behavior of the entire circuit.

“Changes in synaptic plasticity could be one of the mechanisms involved in early learning and memory,” explained Yakel. He defined synaptic plasticity as involving long-term changes — from seconds to minutes and even days — in the synaptic currents generated by the activation of the receptors.



NIEHS Acting Scientific Director David Miller, Ph.D., right, introduced Jack Keene, Ph.D., to the council, as part of the report on the Division of Intramural Research (DIR). Keene is the chair of the NIEHS DIR Board of Scientific Counselors. After Keene gave his report, Miller introduced Yakel as the first scientific speaker at the meeting. (Photo courtesy of Steve McCaw)



Yakel, who has been at NIEHS since 1993, answered many engaging questions, both during and after his talk, from council members and NIEHS employees who came to hear him speak. (Photo courtesy of Steve McCaw)

Previous studies by other researchers have shown that nicotine may have a pro-cognitive or neuroprotective effect in the brain of adults. By combining high frequency electrical stimulation with exogenously applied nicotine to nAChRs in the hippocampus, Yakel's lab is able to convert a short-term activation of the receptors into long-term activation, to enhance the plasticity of the whole circuit. Yakel believes that the long-term activation of the nAChRs could be a possible mechanism involved in the effects of nicotine on the adult brain.

Stimulating endogenous release of acetylcholine

Recently, Yakel has been interested in studying how the release of endogenously stimulated acetylcholine modulates hippocampal synaptic activity and plasticity. Using a combination of genetics and virology in mouse models, Yakel's lab has been able to specifically mark cholinergic neurons and then stimulate the release of acetylcholine by exposing these neurons to light. This input of acetylcholine induces various types of plasticity of the synapses in the hippocampus depending on the timing of the inputs.

"There is exquisite timing where acetylcholine release can dramatically alter the synaptic stream," Yakel concluded.

Tishkoff — "African Integrative Genomics: Implications for Studies of Human Origins and Disease"

Tishkoff opened her talk by observing that her lab is focused on understanding human evolutionary genetics, to better understand the forces that shape and maintain genetic variation in contemporary populations. "I wear many hats," Tishkoff said of her integrative systems and evolutionary biology approach to studying African populations.

Tishkoff pointed out that although Africa is the homeland of all modern humans, it is greatly underrepresented in genomic variability studies. She and her research team have made several trips to the continent over the past ten years, gathering an impressive amount of information about the genetic makeup of its different populations.

According to Tishkoff, understanding how genetic and environmental factors play a role in normal variable traits, such as height, can lead to a better understanding of the genetic architecture of complex traits, including disease susceptibility. She also believes that learning what forces shape genetic variability and plasticity can have a positive impact in the field of pharmacogenetics, the study of how the actions of, and reactions to, drugs vary among individuals.



Council member Palmer Taylor, Ph.D., suggested that Yakel has created a very good system to look at elements of schizophrenia. Palmer said that an animal model for schizophrenia could be very useful in terms of developing and testing therapeutic compounds for the disease. (Photo courtesy of Steve McCaw)



Tishkoff explained that one of her proudest accomplishments during her ten years of going to Africa to conduct research was communicating the findings of her genetic studies to the people who took part in them. "You would be amazed how few people actually return results," she said, noting that receiving the results of her studies made the participants feel important, "like they matter too." (Photo courtesy of Steve McCaw)

Integrative genomics – looking at the whole picture

Instead of taking a traditional genomics approach, Tishkoff incorporates genomic, transcriptomic, epigenomic, proteomic, and metabolomic data obtained from genetically, ethnically, and geographically diverse Africans. Her goal is to identify the genetic and environmental factors that influence complex physiologic traits.

Recently, Tishkoff has undertaken what she describes as the largest study to date of high coverage whole genome variation in Africa. Her lab has sequenced the whole genome of 15 ethnically and geographically diverse Africans. Although the researchers are still in the early stages of analyzing this data, Tishkoff has already found 13 million variants sites that differ from the human reference genome in the sequences of the subjects.

About 5.5 million of these variants are novel, which is impressive considering that the current variant database, dbSNP, already contains about 30.4 million variants. The results of her preliminary study have convinced Tishkoff of the importance of more work of this kind.

(Ashley Godfrey, Ph.D., is a postdoctoral fellow in the Molecular and Genetic Epidemiology Group in the NIEHS Laboratory of Molecular Carcinogenesis.)



Like her colleagues on the NIEHS leadership team, Division of Extramural Research and Training Director Gwen Collman, Ph.D., foreground, followed Tishkoff's narrative with interest. Collman, who introduced Tishkoff's talk, sat with NIEHS/NTP Director Linda Birnbaum, Ph.D., Deputy Director Rick Woychik, Ph.D., and Miller, shown right to left. (Photo courtesy of Steve McCaw)

High impact of basic research in neurobiology at NIEHS

Yakel's most recent work was published in the journal *Neuron*, which is considered the highest impact journal in the neurobiology field. As Yakel said of his study, "We've demonstrated that when we stimulate the release of acetylcholine at just the right time in the hippocampus, we can induce a cellular change at synapses that use glutamate."

In a preview article about Yakel's research, Darwin K Berg, Ph.D., of the University of California, San Diego wrote, "Gu and Yakel in this issue of *Neuron* report an elegant series of experiments in which they analyze the timing required for cholinergic modulation of synaptic plasticity... The authors point out that this timing dependence enables a single cholinergic input not only to determine the kind of plasticity a synapse undergoes but also to determine the synapses affected, thereby constraining the plasticity spatially to those synapses active within the requisite time window."

Citations:

[Berg, DK](#). 2011. Timing is everything, even for cholinergic control. *Neuron* 71(1):6-8.

[Gu Z, Yakel JL](#). 2011. Timing-dependent septal cholinergic induction of dynamic hippocampal synaptic plasticity. *Neuron* 71(1):155-165. [Story](#)

Impacting the scientific community as well as the local African community

One of Tishkoff's main goals is to ensure that her research is carried out in the most ethical manner possible. All of her studies must undergo institutional review board approval from the university, followed by an ethical review by each country where she is working, and then finally she obtains community and then individual consent from each of the participants in any of her studies. Tishkoff is also dedicated to training and capacity building in Africa in an effort to enable the native population to carry on future research on their own.

Along with fellow NIEHS grantee Leona Samson, Ph.D., Tishkoff is a recipient of the [2009 NIEHS Pioneer Award](#). The Pioneer Award provides \$500,000 in funding each year for five years, in support of investigators of exceptional creativity who propose bold and highly innovative new research approaches that have the potential to produce a major impact on broad, important problems in biomedical and behavioral research. One of Tishkoff's recent publications was the result of a ten-year collaboration with African, American, and European researchers.

Citation: Tishkoff SA, Reed FA, Friedlaender FR, Ehret C, Ranciaro A, Froment A, Hirbo JB, Awomoyi AA, Bodo JM, Doumbo O, Ibrahim M, Juma AT, Kotze MJ, Lema G, Moore JH, Mortensen H, Nyambo TB, Omar SA, Powell K, Pretorius GS, Smith MW, Thera MA, Wambebe C, Weber JL, Williams SM. 2009. The genetic structure and history of Africans and African Americans. *Science* 324(5930):1035-1044.

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Conference highlights toxicogenomics, bioinformatics and computational biology

By Eddy Ball

The third international Toxicogenomics Integrated with Environmental Sciences (TIES) conference was held Sept. 15-16 in Chapel Hill, N.C. The conference was webcast in two-way transmission to researchers at the U. S. Environmental Protection Agency's National Center for Environmental Assessment in Washington, D.C. and Health Canada, and in one-way video transmission to other sites worldwide.

Nearly 200 specialists in biology, toxicology, statistics, and bioinformatics gathered at the William and Ida Friday Center for Continuing Education. They explored issues surrounding the use of increasingly complicated and promising platforms that generate rapidly expanding volumes of data on gene, protein, and metabolic patterns of expression as well as emerging technologies such as cellular imaging, epigenetics and predictive modeling. The goal of this kind of research is to characterize and predict molecular responses to environmental exposures on a global scale, to advance both biomedical research and regulatory science.



NIEHS scientists participating at the meeting included members of the TIES organizing committee, Pierre Bushel, Ph.D., shown above, and Rick Paules, Ph.D.; Deputy Director Rick Woychik, Ph.D., who gave opening remarks; and Trevor Archer, Ph.D., who spoke on the critical roles of chromatin in transcription and development. (Photo courtesy of Steve McCaw)

Sponsors of the conference included NIEHS, the University of North Carolina at Chapel Hill (UNC-CH), the Society of Toxicology, Health Canada, the U.S. Food and Drug Administration (FDA), and the SAS Institute.

One important theme of the meeting might be expressed this way — Be careful when you wish for more data, because you might end up facing more difficulty than you ever imagined managing and interpreting all that new information.

Shaking the pillars of the paradigm of average

As the first speaker in session one “Bioinformatics — Revealing pathways and biological systems underlying biological conditions,” Harvard University computational biologist [John Quackenbush, Ph.D.](#), set the tone for his talk and, arguably, the entire conference by quoting mathematician Samuel Karlin. “The purpose of models,” Quackenbush told the audience, “is not to fit the data but to sharpen the questions.”

As biomedical research segues from a laboratory science to an informational science, Quackenbush argued, it becomes important to pay attention to the phenomenology of variance, as well as to the averages typically imposed upon biological data. A holistic approach using rank-ordered-based analysis of gene expression outliers, he said, may offer scientists insight into how the degree of variance influences the phenotype and progression of disease through epigenomic alterations, and provides the spark for evolutionary development.

The data speak, but we must invent their language

One of a host of biostatisticians speaking at the meeting was [Fred Wright, Ph.D.](#), of UNC-CH, who spoke on expression quantitative trait locus (eQTL) analysis and variation in RNA expression.

As Wright explained, the new FastMAP eQTL analysis is several orders of magnitude faster than previous methods. However, he cautioned, it is still up to biostatisticians to develop the model for identifying the most informative single nucleotide polymorphisms (SNPs) and significant combinations for statistical analysis.

In addition to determining which candidates and combinations of SNPs are causal, Wright explained, researchers have to consider several other issues, such as the most informative tissue types for eQTL analysis, whether DNA and RNA are from the same patient, and the possibility that specific DNA sequences used as probes themselves contain SNPs that may affect outcomes.



Quackenbush raised many more questions than he gave answers. He said his audience might feel the way Enrico Fermi said he felt following an especially difficult talk. “Before I came here I was confused about this subject.” Fermi remarked. “Having listened to your lecture, I am still confused, but on a higher level.” (Photo courtesy of Steve McCaw)



Wright, above, argued that linking toxicology with omics and genetics is very important, but it is also a very difficult analytical task, considering that each experiment may generate a terabyte or more of data and integrating a series of studies presents a daunting computational task. (Photo courtesy of Steve McCaw)

Grounding toxigenomics in the realm of public health

Two talks, by NIEHS grantees [Rebecca Fry, Ph.D.](#), of UNC-CH, and [David Threadgill, Ph.D.](#), of North Carolina State University, brought the potential of integrated toxicogenomics home for listeners — both in terms of human health and in terms of environmental exposures in North Carolina.

Fry reported on her work using gene-expression analysis in human subjects to explore the two faces of arsenic, as a chemical that triggers gene expression pathways, which promote oncogenesis and tumor progression, and as a chemotherapeutic agent in the form of arsenic trioxide, which can target some forms of cancer in patients with certain gene expression patterns ([see related story](#)).

Threadgill reported on research inspired by epidemiological studies of exposure to trichloroethylene (TCE) in the water supply at [Camp Lejeune, N.C.](#), and the presence of arsenic in the slate belt of North Carolina. He set up experiments, using ten groups of genetically diverse mice exposed to various combinations of TCE and arsenic, to look at the pathology of exposed animals, gene expression patterns, and the potential synergy of the chemicals in mixture.



Following the first session, Paules, right, talked with [Tim Zacharewski, Ph.D.](#), left, who works on receptor-mediated toxicology as part of the Center for Integrated Toxicology at Michigan State University. Zacharewski is also a faculty trainer for the [NIEHS training grant](#) supporting the university's toxicology graduate program. (Photo courtesy of Steve McCaw)



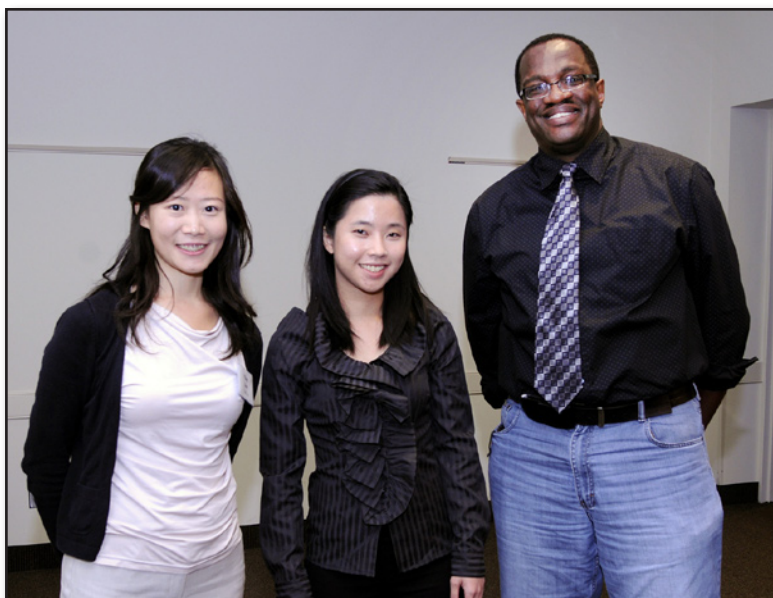
Fry began her talk with a map highlighting areas where high levels of arsenic can leach into wells. North Carolina, she noted, has an arsenic-rich geological formation that runs through the center of the state. (Photo courtesy of Steve McCaw)



Emerging technologies session keynote speaker [William Slikker, Ph.D.](#), director of FDA's NCTR, shared data on his experiments using micro PET and BioSpec MRI imaging in functional, molecular, and behavioral studies of animals exposed to chemicals over time. (Photo courtesy of Steve McCaw)



Threadgill has worked for several years on the Collaborative Cross project to develop out bred mice strains to better mimic the genetic diversity found in human populations. (Photo courtesy of Steve McCaw)



Student and trainee presentations are always an important part of TIES meetings. Bushel, right, presented poster/oral presentation prizes of first place and \$300 to Harvard School of Public Health student Xinyi "Cindy" Lin, center, of second place and \$250 to UNC student Yen Low, left, and of third place and \$200 to NIEHS trainee Steve Roberts, Ph.D., not shown. Awards were provided by the NIEHS Division of Extramural Research and Training. Selected students, including Lin and Low, also gave four of the talks at the conference. (Photo courtesy of Steve McCaw)



During a break in the talks, NIEHS biologist Sylvia Hewitt, left, enjoyed refreshments with NTP molecular biologist Christina Teng, Ph.D. Hewitt was one of several NIEHS staff members, trainees, and grantees participating in the poster competition. Many more people from NIEHS and NTP were among the audience. (Photo courtesy of Steve McCaw)



In keeping with the Wizard of Oz allusion in his talk about potential pitfalls of microarray and RNA-Seq platforms ("Lions and tigers and bears, oh my!"), Wolfinger, shown putting the final touches on his talk, said, "Prediction is a tiger." (Photo courtesy of Steve McCaw)

MAQC — Exploring the future of expression data platforms and analysis

A recurring question throughout the two days of talks was addressed directly in a special session on Microarray Quality Control (MAQC) that concluded the meeting. It confronted head-on the issue of whether the time is right to move from current microarray platforms to emerging next-generation sequencing platforms, which promise even more data about even more aspects of DNA sequence, gene expression, and epigenetic variation.

Moderated by Weida Tong, Ph.D., of FDA's National Center for Toxicological Research (NCTR), speakers surveyed the progress of MAQC through its first two phases, beginning in 2005, and looked forward to the next steps in MAQC III, Sequencing Quality Control (SEQC).

Tong reviewed the rigorous process of validating microarray data to answer the same questions about reliability of platforms and biomarkers that will face participants in SEQC. As with microarray, RNA-Seq platforms will generate massive datasets, multi-site validation to determine repeatability, reproducibility, and accuracy of base calling, mapping to the transcriptome, quantification and differential expression. Tong emphasized that transparency will be just as important in SEQC as it was in the two earlier phases of MAQC, in order to gain the confidence of the research and regulatory communities.

Talks about lessons learned by MAQC consultants Wendell Jones, Ph.D., of Expression Analysis, and Russell Wolfinger, Ph.D., of SAS, concluded the special session and the conference. Both challenged the assumption that more is necessarily better, arguing that researchers need to consider just how many reads they really need and how deeply they really need to probe, as they decide whether to move from microarray to RNA-Seq, with its expanded capacity for analysis.

Wolfinger reinforced Tong's comments about transparency, calling it the only ethical way to proceed. Referring to recent controversies over data integrity, he reminded the audience, "There are a lot of gotchas when it comes to data quality." Wolfinger concluded with an allusion to Occam's razor and the principle of parsimony as a reasonable consideration when deciding whether to switch to RNA-Seq. "If two models seem to do about as well," he said, "go for the simpler one."

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Toxicology and infectious disease research: Is it time for more collaboration?

By Bono Sen

Come each September, it's time for the spike, marking the annual upsurge in asthma cases. With nearly 200,000 children visiting the emergency room with asthma flare-ups each September, it was fitting that NIEHS hosted a workshop Sept 8-9 to bring together public health professionals and toxicologists for an exploration into the interplay of infectious diseases and environmental exposures in the etiology of human disease.



Humble, above, organized the workshop as four sessions of talks, each followed by panel discussions that sparked a lively exchange of ideas about the interplay and synergy of exposures in causing disease. (Photo courtesy of Steve McCaw)

Facilitated by NIEHS Health Scientist Administrator Mike Humble, Ph.D., the workshop examined the state of the science to determine the gaps and set directions for future research initiatives in the field. The meeting represented a joint effort by NIEHS and the National Institute of Allergy and Infectious Diseases (NIAID), and their grantees to encourage future collaborations.

NIEHS Deputy Director Rick Woychik, Ph.D., opened the workshop by pointing out that separation of environmental exposures and infectious agents is problematic. Highlighting key concepts of a [review](#) published in *Environmental Health Perspectives* in 2010 by Ellen Silbergeld, Ph.D., Woychik set the stage for presentations and panel discussions featuring a series of respected researchers in both fields.

An interplay of factors

As the first keynote speaker, Angelika Tritscher, Ph.D., of the World Health Organization, explored [One Health Initiative](#) problems, such as emerging zoonotic diseases and food-borne illnesses, underscoring the need to bring together the disciplines of environmental health and infectious diseases. Later in the meeting, NIAID grantee [Gregory Gray, M.D.](#), returned to these themes in his discussion of his work at the University of Florida Center for Emerging Infectious Diseases.

How something from the environment influences the development and function of the immune response and affects its ability to fight infection was a topic that emerged early in the workshop. Dioxin appears to do so by decreasing T-cell function and also increasing inflammation in the infected lung, according to [Paige Lawrence, Ph.D.](#), whose research focuses on characterizing molecular mechanisms by which pollutants change the immune system's ability to respond to respiratory infections. "Inflammation is important for fighting infection, but too much inflammation is detrimental," she explained.

"What is the impact of inflammatory responses in obesity and type 2 diabetes?" [John Groopman, Ph.D.](#), was curious to know, given the huge public health implications of these diseases. Because the immune response is suppressed by multiple environmental exposures, the link between such diseases and infections could not be explained solely by a simple mechanism. The timing of infection and exposure are critical, Groopman noted, and the answer may be more than immune response alone can explain.



Making the workshop's overview presentation, Tritscher urged the audience to stop the silo thinking about infectious and environmental agents and begin to think globally, both in terms of cause and in terms of geography. "[In today's world,] disease is only a plane flight away," she said. (Photo courtesy of Steve McCaw)



As part of the panel discussing Toxicant Modification of Pathogen Etiology, Lawrence, right, struck a chord that reverberated throughout the workshop about disease etiology, when she said, "I think there's never going to be a single factor." (Photo courtesy of Steve McCaw)

Rethinking intervention strategies

[Fernando Polack, M.D.](#), called for a combination of environmentally and genetically driven intervention strategies to improve health outcomes. His research on levels of endotoxin exposure in rich and poor communities of Buenos Aires, Argentina, suggests that early-life exposures to endotoxins can change the innate immune genotype. According to him, intervention strategies that fail to address the disparate environmental factors associated with the problem leave susceptible populations at a major disadvantage throughout their lives.

Other presenters critiqued the notion of looking at diseases through the lens of a single determinant such as endotoxin. The group dismissed the paradigm of one pollutant, one target, and reiterated the need to look at the totality of response to understand the interactions among the pathogen and environment, and immune response.



Pathogen Modification of Toxicant Etiology panelist [William Busse, M.D.](#), center, added the hygiene hypothesis into considerations of host susceptibility. “If you go to daycare early in life,” he said, “you may be protected [from the effects of exposure to some endotoxins].” Seated beside him are [Kaylon Bruner-Tran, Ph.D.](#), left, and [Robert Roth, Ph.D.](#) (Photo courtesy of Steve McCaw)

Emphasizing actionable science

Along with acknowledgement of the need to understand the mechanisms by which pathogens and toxicants influence each other in the disease process and to prove causality, there was a unanimous recognition of the importance of moving beyond purely mechanistic studies to more translational and actionable science.

“This [workshop] opportunity allowed participants to emphasize additional factors, which are at least as important as individual chemical exposures, and to look at global issues of parasitism, malnutrition, [and] infectious diseases, which often get ignored,” concluded [Peter Spencer, Ph.D.](#), of the Oregon Health and Science University.



Groopman presented impressive figures on the synergy of exposure to hepatitis B virus and aflatoxin in increased risk for liver cancer: Exposure to aflatoxin alone confers a relative risk of 7.3, but in combination with exposure to hepatitis B, relative risk rises to 59.4. (Photo courtesy of Steve McCaw)



Looking back on what participants unanimously considered a productive workshop experience, panelist [Vincent Young, M.D., Ph.D.](#), left, referred to the interdisciplinary gathering as a place where we’re all uncomfortable, because no one can assume the role of expert. He added, “You always think best when you’re a little unbalanced.” Seated beside him is [Jennifer Nyland, Ph.D.](#) (Photo courtesy of Steve McCaw)

Spencer's observations, and the substance of the presentations and discussions, will be included in a paper organizers plan to submit for publication in the near future.

Citation: Feingold BJ, Vegosen L, Davis M, Leibler J, Peterson A, Silbergeld EK. 2010. A niche for infectious disease in environmental health: Rethinking the toxicological paradigm. Environ Health Perspect 118(8): 1165-1172.

(Bono Sen, Ph.D., is the science education and outreach program manager for the NIEHS journal Environmental Health Perspectives.)



NIAID Senior International Science Advisor Karl Western, M.D., right, was on hand to show his institute's support for expanding collaborations. Western moderated the session on One Disease, One Health and the Emergence/Reemergence of Disease. (Photo courtesy of Steve McCaw)



The audience included several NIEHS and NTP scientists, including Rear Adm. William Stokes, D.V.M., center, who leads NTP efforts in alternative testing and in the One Health initiative. (Photo courtesy of Steve McCaw)



In her concluding remarks, NIEHS/NTP Director Linda Birnbaum, Ph.D., reinforced the need to move beyond looking for single causes for diseases and focus instead on the intersection of different factors in causing disease. She also looked ahead to working even more closely with NIAID and its grantees in future collaborations. (Photo courtesy of Steve McCaw)




In his concluding remarks, Director of the NIEHS Center for Risk and Integrated Sciences William Suk, Ph.D., commented on the way the workshop brought in people from very different disciplines and perspectives. "Sometimes even arranged marriages work," he said of the cross-disciplinary and cross-divisional energy generated by the workshop discussions. (Photo courtesy of Steve McCaw)

NIDA director visits NIEHS, provides addiction research update

By Robin Mackar

With her usual amount of passion, Director of the National Institute of Drug Abuse (NIDA) Nora Volkow, M.D., presented an update on drug abuse and addiction research during a noontime presentation Sept. 23, hosted by NIEHS/NTP Director Linda Birnbaum, Ph.D.


Volkow has been the director of NIDA since May 2003. NIDA supports most of the world's research on the health aspects of drug abuse and addiction.



Linked video:

[Watch a New York Times interview with Volkow as she discusses her life and her work \(08:19\)](#)

(Launches in new window)

Download Media Player:  Flash [↗](#)

Volkow's remarks focused on a growing body of knowledge, demonstrating the role that brain circuits play in addiction, reemphasizing that addiction is in fact a brain disease, and providing updates on directions drug abuse researchers are taking to develop targeted medications to address these brain changes.

The role of dopamine

"We now know that all drugs of abuse which lead to addiction have a common characteristic in that they all increase the brain chemical dopamine in the nucleus accumbens," Volkow said. She stated this has been shown in both animals and humans and is believed to be what causes the reinforcing and rewarding effects of drugs that ultimately lead to addiction.

She said what is puzzling is that in some cocaine studies, for example, subjects who are not given cocaine, but other drugs where the pharmacological effect is blunted, still want the drug. "What is driving them to take the drug if they aren't getting the reinforcing effects? That's something I want us to better understand."

Volkow discussed this finding in relation to the elegant, early work of Pavlov, who conditioned dogs to salivate for food in response to an aural cue. She talked about how the brain learns to associate a stimuli with a reward and then become conditioned to expect the reward. The stimuli alone can create the reinforcing effect once the brain is conditioned.

"This is nature at its greatest magnificence," Volkow said, referring to the brain's ability to learn to predict reward and activate the dopamine system and drive behavior.

Volkow used a series of brain images during her talk to demonstrate how circuits are impacted by drugs of abuse and to illustrate that the brain has developed in such a way to be wired to respond to rewards. "If you start to mess with the natural wiring of the brain, the consequences can be so devastating," she said.



Volkow considers herself a scientist first, but she is also noteworthy for being among the highest-ranking women scientists at NIH and the only Hispanic who is the director of an institute or center there. (Photo courtesy of Steve McCaw)

The Complexity of the Issue

Before moving away from her brain circuitry update, Volkow underscored the complexity of addiction and how she wishes someone could develop a compound that could increase expression of what she referred to as dopamine 2 (D2) receptors, which are proteins that help bind dopamine in the brain. She suggested that the number of D2 receptors a person has seems to be an indicator of who might be more vulnerable to addiction. By understanding more about how D2 receptors function, she noted, “We would do a world of good, not just for drug addiction, but for other diseases involving self control.”

Cognizant of the time, Volkow shifted gears near the end of her talk from reward circuitry to what she referred to as the dark side of addiction, mentioning some nicotine research which helped identify a gene cluster association in an area of the brain called the habenula which has been shown to regulate dopamine cell firing and can inhibit dopamine neurons. “This is a fascinating new area that we are exploring.”

(Robin Mackar is the news director in the NIEHS Office of Communications and Public Liaison.)

Institutes with Common Interests

Volkow pointed out that this was the second time she had been to the beautiful NIEHS campus. She recalled her visit in March 2005 when she received the Spirit Award from the NIEHS Diversity Council ([see story](#))

Volkow spent time talking about some of the commonalities between NIEHS and NIDA. “Drugs are chemicals, which are ultimately environmental exposures, which makes them of interest to both institutes,” she pointed out.

In addition to giving a public lecture, Volkow took time during her rainy day trip to North Carolina to meet with members of the leadership team and with key staff from the extramural research and training division and with the two intramural divisions, the Division of Intramural Research and the Division of the NTP.



Joining her colleagues from throughout the Institute at the talk was Mary Wolfe, Ph.D., NTP deputy division director for policy and director of the Office of Liaison, Policy, and Review. (Photo courtesy of Steve McCaw)



Birnbaum, right, joined Volkow for the question-and-answer segment of the talk. (Photo courtesy of Steve McCaw)



Following her talk, Volkow met with several NIEHS and NTP scientists, including Michael Wyde, Ph.D., left, who talked with her about ongoing NTP cell phone studies. (Photo courtesy of Robin Mackar)

Applying 21st century toxicology to green chemistry

By Eddy Ball

Scientists aiming to develop real-world solutions for problem chemicals gathered at a workshop on “[Applying 21st Century Toxicology to Green Chemical and Material Design](#)” Sept. 20-21, at the House of Sweden Event Center in Washington, D.C. The workshop was part of the National Academy of Sciences (NAS) ongoing series organized by the Committee on Emerging Science for Environmental Health Decisions sponsored by NIEHS. This workshop was unique in that it was co-hosted by the [National Science and Technology Councils \(NSTC\) Committee on Environment, Natural Resources, and Sustainability \(CENRS\) Subcommittee on Toxics and Risks](#).

With more than 83,000 chemicals available for use in the U.S. today, there is rising concern about potential toxic properties these chemicals pose in relation to human health and the environment. This issue has given rise to the field of green chemistry — the science-based design of chemicals to minimize the use and generation of hazardous substances.

Visioning a green future

The workshop brought together chemists, toxicologists, and biologists to define common goals, identify knowledge gaps, and promote applied research aimed at expediting the application of new approaches to toxicology to the emerging field of green chemistry.

As he opened the meeting, NIEHS Toxicology Liaison and co-chair of the NSTC Subcommittee on Toxics and Risks [Christopher Weis, Ph.D.](#), challenged participants to think of a future with safer chemicals and less need for regulation.

[Paul Anastas, Ph.D.](#), assistant administrator of the U.S. Environmental Protection Agency Office of Research and Development, who is often referred to as the father of green chemistry, then set the stage for the meeting’s three sessions with a presentation, titled “Vision of a Green Chemical Future.” Anastas told participants, “There are tremendous advantages — environmental, economic, and health-related — in implementing green chemistry into the design and production of the next generation of chemicals.”

The main focus of the sessions centered on identifying replacements for problematic chemicals and the emerging tools available for toxicology testing. Representatives from industry, academia, and government agencies discussed the utility of rapid assessment approaches in toxicology, including high-throughput biochemical screening, *in vitro* cellular approaches, and rapid assessments using aquatic organisms.

Putting the plan to action

During session three, [Thaddeus Schug, Ph.D.](#), a postdoctoral fellow on detail to the NIEHS Division of Extramural Research and Training, highlighted a collaborative project that is constructing a protocol for chemists to flag endocrine disruptors early in chemical development. “The protocol is not regulatory,” Schug emphasized, “but a guide chemists can follow as they develop a chemical, to give them confidence as to whether the substance is or is not an endocrine disruptor.”



“What we propose to do is put the fastest, cheapest testing up front, the computational modeling, followed by high throughput screening and the zebrafish models,” Schug explained. The first-tier testing would be followed up with more specific testing as a chemical moves farther along the developmental process. (Photo courtesy of Steve McCaw)

The project, which is sponsored by the groups [Advancing Green Chemistry](#) and Environmental Health Sciences, publisher of [Environmental Health News](#), has come up with a tiered system.

“The idea is if chemists hit a positive early on, they would either go back to the drawing board, or if that positive was in a specific area, such as an estrogen receptor in a high throughput assay, they’d follow that up with more comprehensive assays,” Schug continued. “A hit anywhere along the tiered system means chemists need to pull back, reanalyze, or throw the chemical out.”

The protocol is voluntary, explained [Bruce Blumberg, Ph.D.](#), a professor of developmental and cell biology at the University of California, Irvine. “We suggest this if you want to screen for endocrine activity in your chemicals and make them more green – this is the way we think you should do it. We’re providing an alternative approach interested parties can use to make the best chemicals they can,” he said.

[Richard Denison, Ph.D.](#), senior scientist at Environmental Defense Fund, welcomed the protocol’s development, saying, “It really flips the concept of tiered testing around.” Usually in tiered testing, a chemical only advances to the next level of testing if it is flagged for an effect at an earlier level. “[That] puts a huge question mark around the extent to which false negatives are being missed,” Denison added.



“Dream big of a future in which green chemistry will move into the marketplace to the extent that this science will ultimately short-circuit the need for regulation,” Weis told workshop participants. “This will allow us to think ahead about potential chemical effects, rather than respond to problems that arise after chemicals are introduced.”
(Photo courtesy of Steve McCaw)

Register online to view archived videos

Seven videos of the session are archived online. To view them, register for the series at <http://dels-old.nas.edu/envirohealth/GreenChemistry.shtml>.

Upcoming workshops in the Emerging Science for Environmental Health Decisions Series

The [series](#) continues with two leading-edge workshops scheduled for the winter of 2011 and spring of 2012.

Dec. 8–9, 2011 — [Emerging Technologies for Measuring Individual Exposomes](#), at House of Sweden, Washington, D.C.

Apr. 18–19, 2012 — Individual Variability – information forthcoming

Additional information about these workshops will be posted as it becomes available. To be notified of updates, please [subscribe](#) to the Emerging Science for Environmental Health Decisions listserv. Workshops are free and open to the public, but advance registration is required.

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Meyer returns to NIEHS to discuss mitochondrial DNA damage

By Jeffrey Stumpf

It was a homecoming of sorts for Duke University Nicholas School of the Environment Assistant Professor and NIEHS Outstanding New Environmental Scientist (ONES) awardee [Joel Meyer, Ph.D.](#), who presented a lecture at NIEHS Sept. 21. The former Laboratory of Molecular Genetics postdoctoral fellow summarized his research on the effects of mitochondrial DNA damage caused by environmental agents, work he began during his training at NIEHS.

As cellular power plants, mitochondria produce the majority of the energy storage molecule ATP. Mitochondria also contain a small genome, separate from nuclear DNA, that encodes 13 proteins necessary for ATP production. Because the mitochondrial genome (mtDNA) is essential for healthy cells, mtDNA mutations are associated with mitochondrial diseases, Parkinsonism and Alzheimer's disease, aging, and cancer.

Mitochondria as the canary in the cell

MtDNA is as much as 50- to 500-fold more sensitive to environmental damaging agents than nuclear DNA, providing a direct impact on human health. For instance, many potential pharmaceutical agents have been rejected because of intolerable side effects due to mitochondrial damage.

"Screening for mitochondrial toxicities is something drug companies spend a lot of time studying," Meyer explained. The economic consequences of failure so far into the process of drug development can be disastrous.

Pollutants such as polycyclic aromatic hydrocarbons, commonly called PAHs, food contaminants such as mycotoxins, and environmental damaging agents such as UV sunlight are also harmful to mitochondria. Meyer insists that mitochondrial damage caused by environmental agents deserves much more attention than it has received.

"Most pollutants are much less studied than almost any pharmaceutical, and yet it took decades to determine that some pharmaceuticals are mitochondrial toxins," Meyer remarked.

What do cells do with damaged mitochondria?

While nuclear DNA has an array of repair mechanisms, UV-damaged nucleotides in mtDNA are not repaired. One possible outcome is that mtDNA replication proceeds through the damage. Meyer presented data from collaborations with NIEHS researchers William Copeland, Ph.D.,



Meyer answered a question about possible epigenetic responses to mitochondrial DNA damage. His interest in mitochondria dates back to the end of his graduate work that led to superfund research. (Photo courtesy of Steve McCaw)



NIEHS Program Analyst Astrid Haugen introduced her former colleague in the LMG. (Photo courtesy of Steve McCaw)

and Rajesh Kasiviswanathan, Ph.D., demonstrating that replication past mtDNA damage causes insertion of incorrect nucleotides which could cause mutations. Because mtDNA is inherited only maternally, Meyer considered the consequences of a mutagenic effect of mtDNA damage that could linger through generations.

“What’s frightening from a human health perspective is that you might have to think about the grandmother’s exposure to environmental agents,” Meyer postulated.

There are hundreds of mitochondria and thousands of mtDNA molecules per cell, implying that infrequent mtDNA damage is inconsequential. To study the fate of damaged mtDNA, Meyer tested the effects of UV light on the roundworm *Caenorhabditis elegans*, whose life cycle makes it an ideal model organism. Copy number of mtDNA follows a bottleneck pattern, where mtDNA is most prevalent in the mature oocyte but drops precipitously during the first larval stage (L1) as cell division occurs without mtDNA replication. MtDNA copy number increases during the subsequent larval stages, returning to the high copy number in the next oocyte.

Transition from the third to fourth larval (L3 to L4) stage requires functional mitochondria. Meyer’s research group applied UV damage at the first larval stage (L1) of worms that were deficient in several pathways involved in mitochondrial maintenance and counted those that survived to L4.

Meyer definitively demonstrated that worms unable to fuse mitochondria died of mitochondrial defects after UV exposure. This result suggests that a typical response to persistent mtDNA damage involves joining mitochondria with undamaged mtDNA and targeting damaged mitochondria for degradation. Interestingly, mutations in the human mitochondrial fusion gene OPA1 are associated with mitochondrial disease, and environmental exposures could exacerbate the disease state.

“It gets back to the NIEHS paradigm,” Meyer explained. “There are genetic effects that are associated with mitochondrial related diseases and [environmental] exposures causing persistent mtDNA damage. The interaction of those two in the context of when the exposure occurred will be most important.”

(Jeffrey Stumpf, Ph.D., is a postdoctoral fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)



As chief of the LMG and head of the Mitochondrial DNA Replication Group, William Copeland was clearly interested in Meyer’s findings about mtDNA and mitochondrial disease. (Photo courtesy of Steve McCaw)



Kasiviswanathan, a postdoctoral fellow in the Mitochondrial DNA Replication Group, collaborated with Meyer’s group to determine the mutagenic potential of UV-induced mtDNA damage. (Photo courtesy of Steve McCaw)

Expanding research into gene-environment interactions

Meyer has received NIEHS [support](#) for his long-term career commitment to research in areas of environmental health and problems of environmental exposures and disease. NIEHS Division of Extramural Research and Training Program Administrator, Cindy Lawler, Ph.D., believes that Meyer's research is well focused on the mission of NIEHS.

"Joel will bring his expertise in mtDNA damage and repair pathways, together with a tractable model system, to address a novel gene-environment interaction hypothesis in Parkinson's disease," commented Lawler. "The knowledge gained in his studies may help to identify susceptible populations for targeted prevention efforts and suggest new avenues for intervention."

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Menthol may promote nicotine addiction

By Raluca Dumitru

Respiratory experts know and most smokers agree that cigarette smoking is addictive, but research from an NIEHS [grantee](#) determined that nicotine may not be the only culprit involved in getting smokers hooked on cigarettes.

Sven-Eric Jordt, Ph.D., an associate professor in the Department of Pharmacology at the Yale University School of Medicine, found that menthol, a common cigarette additive, may encourage smokers to smoke more because it shuts down the body's coughing mechanism. His findings appeared [online](#) in the Sept. 8 issue of The FASEB Journal, and could help smokers understand why their habit is so hard to break.

"Almost all 'regular' cigarettes contain some menthol, while brands marketed as mentholated represent 30 percent of the cigarette market," Jordt said. "Our work suggests that the addition of menthol likely reinforces smoking behavior even when added in small amounts."

Making smoking easy

Menthol is the cooling agent in peppermint, and [Jordt](#) used a mouse model to study its effects on sensory irritation. He and his collaborators showed that menthol acts through the chemical receptor TRPM8 in the airway-innervating nerves and exerts counterirritant effects. In other words, since coughing is the usual response to the inhalation of an irritant, smoking a soothing menthol cigarette allowed the mice to breathe in more smoke. This action may facilitate exposure to higher levels of nicotine and tobacco toxicants, which can lead to rapid nicotine addiction. In contrast, when menthol was omitted from these studies, mice had a much harder time inhaling tobacco smoke irritants and, as a consequence, exhibited a lowered respiratory rate, the mouse response to irritation in the lung.



Jordt was a member of the first class of NIEHS Outstanding New Environmental Scientist awardees and winner of the prestigious Presidential Early Career Awards for Scientists and Engineers for his outstanding research on the effects of environmental irritants in airway diseases and inflammation. (Photo courtesy of Steve McCaw)

Jordt said that one of the major technical challenges in this study was the design of an exposure system that allowed the mice to breathe in vaporized menthol and selected cigarette smoke irritants in a way that produced accurate and reproducible exposures. Such a system required tight control of airflow, mixing, vaporization of menthol and irritants, and highly accurate gas sampling and analytics.

“Thanks to the ingenuity of our collaborator, [John Morris, Ph.D.](#), a professor of Pharmacology and Toxicology and assistant dean for Research in the School of Pharmacy at the University of Connecticut in Storrs, Conn., we overcame these technical challenges,” Jordt added. “Dr. Morris’ expertise in inhalation toxicology really enabled this project from the beginning.”

Menthol encourages younger smokers

Jordt’s findings suggest that the presence of menthol in cigarettes has devastating consequences for young people because it eases their transition to becoming hardcore smokers. Coupled with the grim health [statistics](#) from the Centers for Disease Control and Prevention (CDC) on the negative health impacts of smoking, researchers and public health officials can work together to decrease smoking-related illnesses in the U.S. by educating young adults on the dangers of trying that first cigarette.

Jordt said, “From the onset of our study, we were especially intrigued by the fact that young beginning smokers strongly favor mentholated cigarettes and that the tobacco industry has increased marketing efforts and designed specific products directed at this population. We hope that our new study will be considered in the FDA [U.S. Food and Drug Administration] assessment of the impact of mentholated cigarettes.”

In addition to funding by NIEHS, this study was supported by grants from the [National Heart and Lung Institute](#) and the American Asthma Foundation.

Citation: [Willis DN, Liu B, Ha MA, Jordt SE, Morris JB](#). 2011. Menthol attenuates respiratory irritation responses to multiple cigarette smoke irritants. *FASEB J*; doi:10.1096/fj.11-188383 [Online 8 September 2011].

(Raluca Dumitru, M.D., Ph.D., is an Intramural Research Training Award fellow in the Stem Cell Biology Group in the Molecular Carcinogenesis Laboratory.)

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Superfund study examines carcinogenicity of nickel nanoparticles

By Nancy Lamontagne

NIEHS-funded researchers at Brown University have published a study showing evidence that nickel nanoparticles activate a cellular pathway that contributes to cancer in human lung cells. The [study](#) was published online Aug. 9 in *Toxicological Sciences*.

Materials produced on a nanoscale have different properties than they do at larger scales, and these unique properties make nanomaterials attractive for use in medicine, electronics, and energy production. The Brown University researchers studied various types of nickel nanoparticles, which are used in sensors and energy storage devices, as well as for a catalyst for making certain types of carbon nanotubes. Inhalation exposure to nickel and nickel oxide nanoparticles could occur during manufacturing processes, yet the potential carcinogenicity of these nanoparticles is not known.

Micron-sized particles of poorly soluble nickel compounds are known carcinogens, but the same is not true for metallic nickel. To explore how particle size affects toxicological properties, [Agnes Kane, M.D., Ph.D.](#), and a team of pathologists, engineers, and chemists exposed *in vitro* human lung epithelial cells to metallic nickel and nickel oxide nanoparticles, and to larger metallic nickel micro-scale particles.

Activating a pathway implicated in tumor growth

The researchers observed release of nickel II ions 24 to 48 hours after uptake of metallic nickel and nickel oxide nanoparticles, but not after uptake of metallic nickel microparticles. Nickel II ions have been associated with the carcinogenicity of nickel.

In addition, the metallic nickel nanoparticles activated the HIF-1 alpha pathway and also caused cytotoxicity, while the larger micron-sized nickel particles did not. The HIF-1 alpha pathway normally helps trigger genes that support a cell during hypoxia and is also known to encourage tumor cell growth. Nickel exploits the HIF-1 alpha pathway by tricking the cell into thinking hypoxic conditions are present, and the subsequent pathway activation may give premalignant tumor cells a head start, Kane said.

Surface area may be the key to toxicity

According to the researchers, the nanoscale metallic nickel particles might be more harmful and potentially carcinogenic because, for the same amount of metal by mass, they have a greater surface area than microparticles. This makes the nanoparticles much more chemically reactive.

The work also showed a difference in how nickel nanoparticles and nickel oxide nanoparticles react with cells. Cells exposed to nickel oxide nanoparticles died quickly, leaving no opportunity for cancer to develop. However, metallic nickel nanoparticles were less likely to kill the cells, which could allow the HIF-1 alpha pathway to lead to the cell becoming cancerous.

Implications of the study

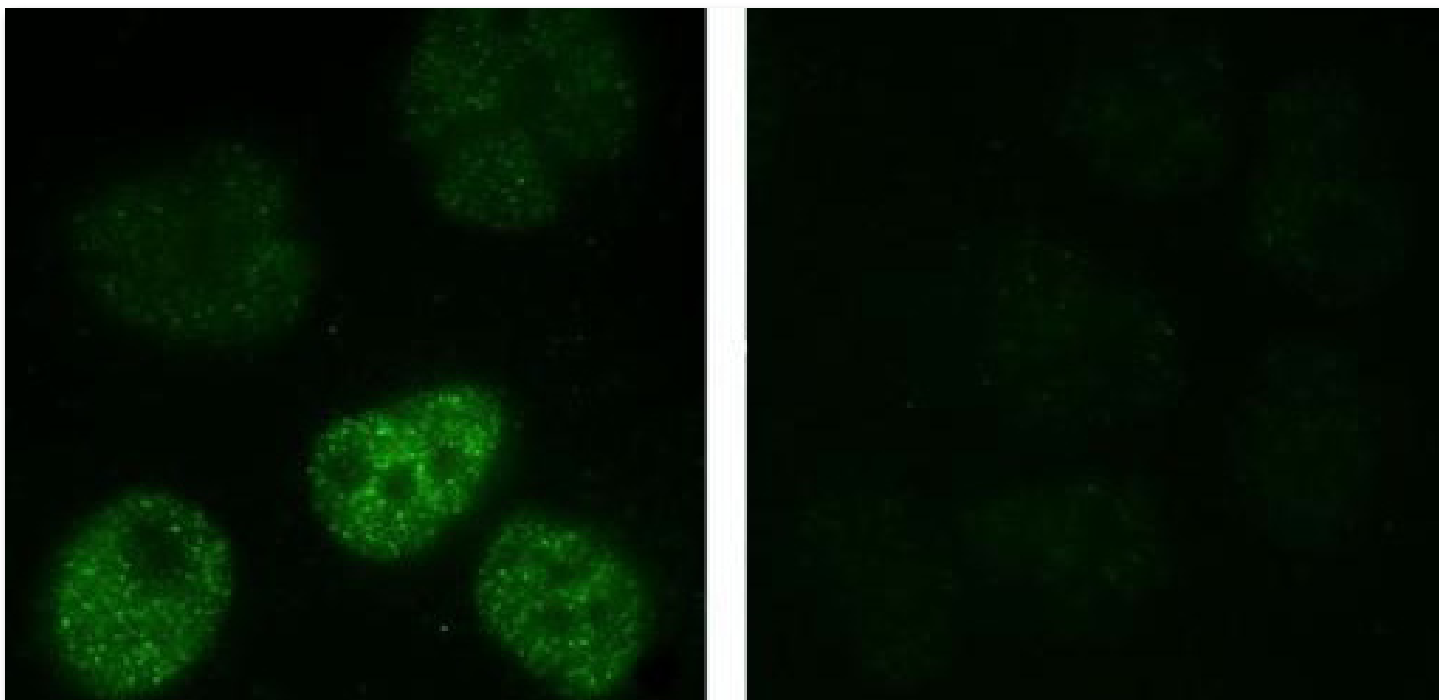
Kane said cancer typically depends on a number of changes, and cautions that the study examined only the short-term effects of nickel nanoparticle exposure in cells in a lab, not long-term exposure in a whole organism. Still, she said that the findings should raise clear concerns about handling nickel nanoparticles. For example, precautions should be taken during manufacturing to prevent airborne exposure.

In addition, the researchers suggest that screening assays used to evaluate the toxicity of nickel nanoparticles should include cellular bioavailability of metal ions and activation of the HIF-1 alpha pathway. These assays could be used to screen other commercial nanomaterials that contain nickel and nickel oxide, including nanowires, carbon nanotubes, and nickel nanocomposites used in medical implants and for drug delivery.

Kane's research is supported by two NIEHS Superfund Research Program grants and a grant from the U.S. Environmental Protection Agency.



Kane, above, spoke at a 2009 meeting on asbestos sponsored by the NIEHS Superfund Research Program, held in Chapel Hill, N.C. (Photo courtesy of Steve McCaw)



Human lung epithelial cells were exposed to the same doses of nano-sized, left, or micro-sized, right, metallic nickel particles. Activated HIF-1 alpha pathways (green) appear mostly in the cells exposed to the nanoparticles. (Photo courtesy of Agnes Kane)

Citation: Pietruska JR, Liu X, Smith A, McNeil K, Weston P, Zhitkovich A, Hurt R, Kane AB. 2011. Bioavailability, intracellular mobilization of nickel, and HIF-1 {alpha} activation in human lung epithelial cells exposed to metallic nickel and nickel oxide nanoparticles. *Toxicol Sci*; doi: 10.1093/toxsci/kfr206 [Online 9 August 2011].

(Nancy Lamontagne is a staff writer with MDB, a contractor for the NIEHS Superfund Research Program and Worker Education and Training Program.)

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NTP alternatives center showcases accomplishments

By NICEATM

Members of the National Toxicology Program (NTP) Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM) traveled to Montreal, Canada, last month to attend the Eighth World Congress on Alternatives and Animal Use in the Life Sciences Aug. 21-25. This international meeting, with more than 800 attendees from 52 countries, provided NICEATM staff with a venue for showcasing their recent accomplishments, as well as a chance to interact with other scientists to identify better and more humane safety testing methods, to protect people, animals, and the environment.

The World Congress is a biennial international scientific conference that supports progress in the life sciences and application of the ethical principles of animal use. The specific goal of this year's World Congress was to explore ways to bridge the gap between science and policy and to identify opportunities for collaboration.

“The World Congress brought together stakeholders interested in both life sciences research and animal welfare from diverse organizations and disciplines,” noted Rear Adm. William Stokes, D.V.M., director of NICEATM. “Since 1993, these meetings have provided important opportunities to exchange information on ways to advance science while observing the three Rs — reducing, refining, and replacing animal use where feasible.”

NICEATM management chair sessions

At the meeting, Stokes chaired a session that reported on a workshop for alternative methods to animal usage in vaccine potency and safety testing. Held in September 2010, this workshop was organized by NICEATM and the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) along with various other international validation organizations. The co-chairs of the ICCVAM Interagency Biologics Working Group, Jodie Kulpa-Eddy, D.V.M., of the U.S. Department of Agriculture (USDA), and Richard McFarland, M.D., Ph.D., of the U.S. Food and Drug Administration, presented summaries of the workshop recommendations for human and veterinary vaccines.

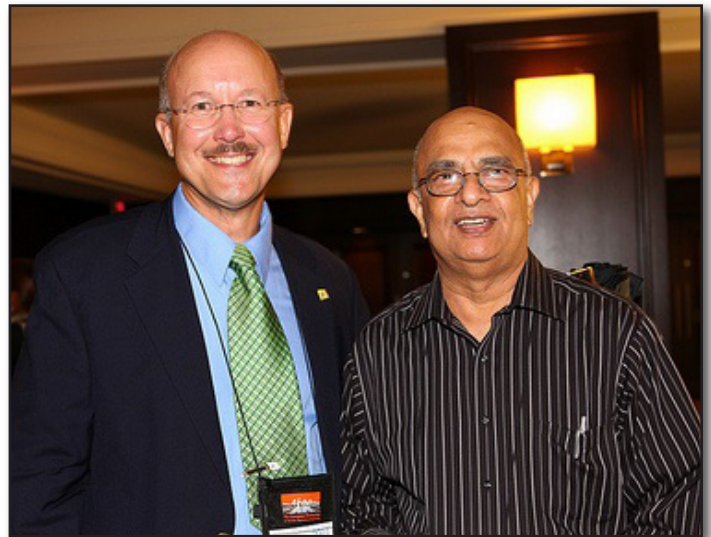
Later in the meeting, Stokes chaired a session that presented updates from the International Cooperation on Alternative Methods (ICATM), a joint, multi-national effort to coordinate the validation, acceptance, and use of alternative methods for safety testing.

NICEATM Deputy Director Warren Casey, Ph.D., co-chaired two sessions at the conference, “Validation and Three Rs Strategies for Assessment of Endocrine-Active Substances,” and “Update on New *In Vitro* Models for Detection and Potency Assessment of Botulinum Neurotoxin.”

In other activities at the meeting, Stokes spoke on “Validation of the 21st Century Toxicology Toolbox: Challenges, Opportunities, and the Way Forward” at a session focused on the process of ascertaining that a test method is accurate and reproducible. Nine poster presentations by NICEATM staff and ICCVAM members highlighted activities related to allergic contact dermatitis testing, ocular safety testing, and vaccine potency and safety testing. Rajendra Chhabra, Ph.D., director of toxicology training and coordination in the Division of the NTP presented a poster on environmental enrichment of animals in NTP studies.



Leaders in U.S. alternative testing clearly enjoyed sharing their accomplishments with counterparts worldwide. Shown, left to right, are Kulpa-Eddy, Stokes, and Chester Gipson, D.V.M., deputy administrator for animal care at the USDA Animal and Plant Health Inspection Service. (Photo courtesy of 8th World Congress on Animal Use in the Life Sciences, Montreal, Canada)



Stokes and Chhabra, right, are shown during a break in the proceedings. (Photo courtesy of 8th World Congress on Animal Use in the Life Sciences, Montreal, Canada)

NICEATM participates in World Congress satellite meetings

Stokes and Casey participated in a satellite workshop focused on developing alternatives to the *in vivo* test commonly used for evaluating the safety of pertussis vaccines. Co-organized by NICEATM with Health Canada, and co-chaired by McFarland, the workshop reviewed new *in vitro* methods, and discussed additional studies that may be necessary. A follow-up meeting hosted by NICEATM and ICCVAM will be held in September 2012 at the William H. Natcher Conference Center at NIH in Bethesda, Md.

On the final day of the World Conference, NICEATM staff participated in a coordination meeting with representatives of each ICATM organization. This provided an opportunity for the five ICATM organizations to discuss activities in the three major areas of cooperation: test method validation studies, international peer reviews, and harmonized test method recommendations.

A summary of all NICEATM-ICCVAM activities at the Eighth World Congress, including abstracts of poster and platform presentations and copies of all posters, can be found on the NICEATM-ICCVAM [website](#). Proceedings of the World Congress will be published as a special issue of the journal ALTEX in 2012.



Shown left to right, Casey, Stokes, NICEATM contractor David Allen, Ph.D., of Integrated Laboratory Systems, Inc., and McFarland flank the World Congress banner with its impressive list of sponsors. (Photo courtesy of 8th World Congress on Animal Use in the Life Sciences, Montreal, Canada)

NICEATM to sponsor rabies vaccine workshop

One of the top priority recommendations from the September 2010 NICEATM-ICCVAM workshop on vaccine potency and safety testing was to convene a workshop on alternatives to current methods for potency testing of rabies vaccines. That recommendation will be addressed at a workshop to be held Oct. 11-13 in Ames, Iowa. Information on the “International Workshop on Alternative Methods for Human and Veterinary Rabies Vaccine Testing: State of the Science and Planning the Way Forward” is available on the NICEATM-ICCVAM [website](#).

The rabies vaccine workshop is being organized by NICEATM and ICCVAM along with their ICATM partners, the European Centre for the Validation of Alternative Methods, the Japanese Center for the Validation of Alternative Methods, and Health Canada.

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Researchers discover how *Geobacter* remove uranium contamination

By Nancy Lamontagne

A new [study](#) funded in part by NIEHS has revealed that *Geobacter* bacteria use their conductive hair-like filaments or pili to clean up nuclear waste and other contamination. The study was led by Michigan State University researchers and appeared online Sept. 6 in the Proceedings of the National Academy of Sciences (PNAS).

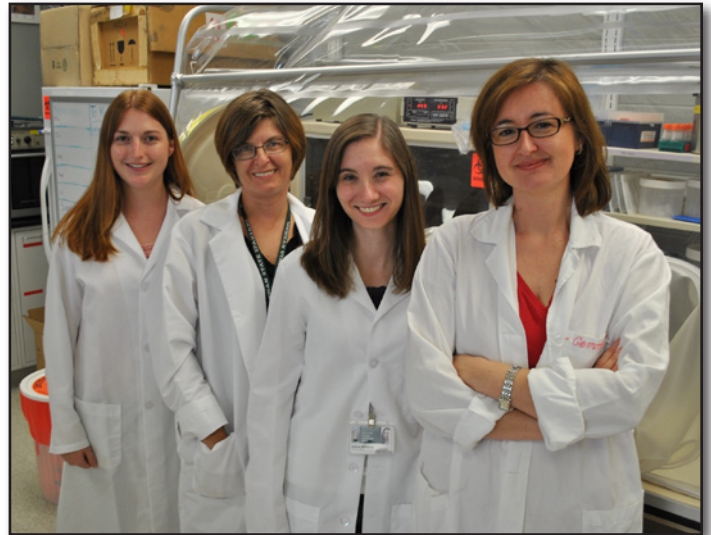
Uranium contamination can occur at any step in the production of nuclear fuel and is also a problem in groundwater because of mining practices used during the Cold War era. *Geobacter* is known to immobilize uranium but, until now, scientists hadn't understood exactly how the bacteria performed this feat. Understanding the process could aid in the design of better uranium bioremediation strategies to limit human exposure to this dangerous element.

Conductive filaments are key to uranium removal

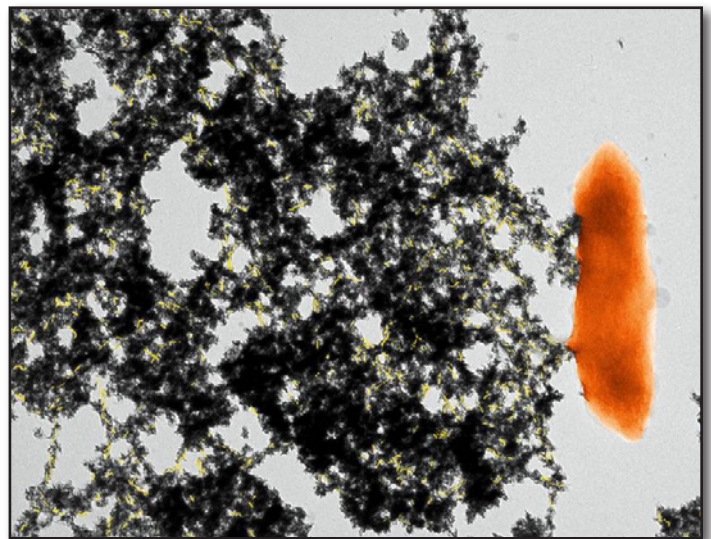
Microbiologist [Gemma Reguera, Ph.D.](#), and colleagues found that *Geobacter*'s conductive pili, which function as microbial nanowires, are key for reducing the soluble form of uranium into a less-soluble form that may allow for easier removal. They made this discovery by growing the bacteria at temperatures that either induced or did not induce pili formation and comparing these wild-type bacteria with a mutant form lacking a pili-producing gene and an engineered strain into which the gene had been reintroduced.

The researchers found that *Geobacter* expressing pili removed more uranium from a solution than those without pili. The piliated bacteria deposited uranium outside their cells and kept the uranium from permeating their periplasm, the space just inside the external membrane. The piliated bacteria also had greater respiratory activity, were more viable, recovered from uranium exposure, and grew faster than pili-deficient strains. Non-piliated bacteria incorporated more uranium into their periplasm and cell membranes.

The pili also serve to shield *Geobacter*, allowing them to thrive in a harsh environment. "They are essentially performing nature's version of electroplating with uranium, effectively immobilizing the radioactive material



Reguera and co-authors are pictured in their lab. Shown, left to right, are Ph.D. student Allison Speers, postdoctoral researcher Sanela Lampa-Pastirk, Ph.D., first author and Ph.D. student Dena Cologgi, and Reguera. Not shown, postdoctoral researcher Shelly Kelly, Ph.D. (Photo courtesy of Michael Steger, Michigan State University)



A *Geobacter sulfurreducens* cell uses its conductive pili to transfer electrons and reductively precipitate uranium (black precipitate). The figure has been manually colorized to highlight the cell (orange) and the pilus nanowires (yellow). (Graphic courtesy of Dena Cologgi and Gemma Reguera, Michigan State University)

and preventing it from leaching into groundwater,” Reguera said. The findings suggest that pili expression gives *Geobacter* an adaptive advantage when it is in a contaminated area.

Geobacter bacteria gain energy for growth by transferring electrons generated inside the cell to external electron acceptors, a process that could potentially be used for electricity generation. Reguera has filed patents to build on her research, which could lead to the development of microbial fuel cells that generate electricity while cleaning up contaminants.

In addition to [funding](#) by the NIEHS Superfund Research Program, the team also received support from the U.S. Department of Energy.

Citation: [Cologgi DL](#), [Lampa-Pastirk S](#), [Speers AM](#), [Kelly SD](#), [Reguera G](#). 2011. Extracellular reduction of uranium via *Geobacter* conductive pili as a protective cellular mechanism. *Proc Natl Acad Sci U S A*. 108(37):15248-15252.

(Nancy Lamontagne is a staff writer with MDB, a contractor for the NIEHS Superfund Research Program and Worker Education and Training Program.)


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Women scientists shine at NCSOT meeting

By Eddy Ball

This fall’s [North Carolina Chapter of the Society of Toxicology \(NCSOT\)](#) meeting at NIEHS Sept. 22, as usual, showcased the talents of trainees and keynote talks by three invited speakers. But what made this meeting stand out was its domination by women scientists.



Chaired by NC SOT President [Darol Dodd, Ph.D.](#), the meeting opened with presentation of the group’s President’s Award for Research Competition (PARC) to three area postdoctoral fellows, all young women, and a talk by first-place winner Lisa Kurtz, Ph.D., a postdoctoral fellow at [The Hamner-University of North Carolina \(UNC\) Institute for Drug Safety Sciences](#).



Linked video:

Watch as Paul Watkins, M.D., director of [The Hamner-UNC Institute for Drug Safety Sciences](#), discusses the major goals for the institute (03:02)

(Launches in new window)

Download Media Player:  Flash 

Kurtz presented findings from a study of genes differentially expressed by a genetically diverse population of 34 strains of mice, with the goal of ultimately predicting which patients treated with the powerful tuberculosis drug isoniazid might develop liver toxicity. Her group is especially concerned about the small minority who progress to hepatitis and the approximately one percent who develop potentially fatal drug-induced liver injury.

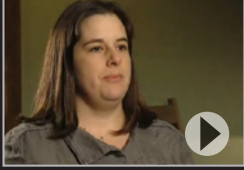


Dodd, who is senior toxicologist at The Hamner Institutes, introduced the program, noting proudly that NCSOT is the largest regional chapter of SOT with 373 members, 106 of them postdocs and students. He also announced the upcoming spring meeting and poster session to be held at EPA Feb. 23. (Photo courtesy of Steve McCaw)

The main program, designed by NCSOT Vice-president Mike Hughes, Ph.D., focused on new discoveries about the role of epigenetic alterations in environmental health by two [NIEHS Outstanding New Environmental Scientist \(ONES\)](#) awardees, followed by a consideration of issues regulators could face as they incorporate this new science into evaluation of safety and risk.

“Environmental Epigenetics: From Mice to Men”

Leading off the program of keynote speakers was University of Michigan geneticist [Dana Dolinoy, Ph.D.](#), who presented an introduction to and brief history of research into epigenetic modifications, the potentially heritable changes in gene expression that occur without changes in DNA itself. Dolinoy described experiments with Agouti mice exposed to levels of bisphenol-A (BPA) that altered coat color, body composition, and susceptibility to disease.



Linked video:
[Watch as Dolinoy talks about her research on BPA and the human genome \(01:57\)](#)
(Launches in new window)

Download Media Player: Flash

Dolinoy has expanded her research strategy with whole genome next-generation deep sequencing in animals to discover links between epigenetic changes and adverse phenotype in experiments with various doses of BPA, by itself and in mixture with phthalates.

Referring to her more recent work with human clinical samples, Dolinoy talked briefly about new population-based studies with a Mexico City birth cohort and with a cohort of urban and rural girls in Egypt. Despite exciting new findings from epigenetic studies by her group and others, Dolinoy conceded, “We’re still in the infancy of this field.”

“Arsenic and the Epigenome”

Expanding on the theme of giving epigenetics a very human face, UNC toxicologist [Rebecca Fry, Ph.D.](#), began her talk close to home with a reference to her recent survey of wells that provide water to 2.3 million people in North Carolina. The survey found levels of iAS as high as 196 parts per billion (ppb) in the most highly contaminated wells — nearly 20 times the [so-called safe level of 10 ppb](#) established by the World Health Organization and U.S. Environmental Protection Agency (EPA).



Dodd congratulated this year’s PARC winners on the prizes and announced cash awards from NCSOT sponsors. Shown, left to right, are Kurtz, first prize and \$500 from Charles River Laboratories; EPA postdoc [Nicole Kleinstreuer, Ph.D.](#), second prize and \$250 from VWR International; NIEHS/NTP postdoc [Yang Sun, Ph.D.](#), third place and \$100 from VWR International; and Dodd. (Photo courtesy of Steve McCaw)



Hughes, a scientist with EPA, created an integrated agenda on epigenetics that segued smoothly from leading-edge exploratory research into the questions about regulation that arise as a response to the findings. (Photo courtesy of Steve McCaw)

Fry reported on her work with a cohort of residents of Zimapan, Mexico exposed to levels of inorganic arsenic (iAs) as high as 1,000 ppb in their drinking water. With a cohort of infants, Fry is investigating how gestational exposure to arsenic alters newborn expression of genes, particularly those involved in tumor suppression, along the NF- κ B inflammatory response pathway, how this modulation is influenced by newborn genetics and epigenetics, and how gestational exposure to iAs influences risk for developing cancer, diabetes, and cardiovascular disease in adulthood.



Questions about regulation in regard to epigenetic effects

The final speaker of the day, veterinary pathologist [Doug Wolf, D.V.M., Ph.D.](#), admitted as he began his talk that he had far more questions than answers to offer about epigenetics from his perspective as a regulatory scientist with the EPA. Wolf reviewed the regulatory scheme for making decisions about mutagenic chemicals and speculated about how that framework might deal with chemicals that trigger epigenetic changes.

“Epigenetics is kind of in this gray zone [of regulatory status],” he said. “Variability issues make this more complicated [because] of age- and diet-dependent differences among affected individuals.”



Fry, who found 183 genes differentially expressed in iAs-exposed individuals, speculated that different exposures probably will show different patterns. “Every contaminant may have a different profile,” she said, underscoring the need for much more research about epigenetic modifications triggered by environmental exposures. (Photo courtesy of Steve McCaw)

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Former NCSOT student winner Dolinoy's ties to the Triangle area go back to her time as a graduate student at Duke University and postdoctoral fellow in the lab of [Randy Jirtle, Ph.D.](#) (Photo courtesy of Steve McCaw)



Wolf cautioned his audience to think more broadly about how to determine adversity before taking on new regulatory responsibilities in terms of safety and health risks from epigenetic modifications. He concluded his talk by referring back to his self-effacing introduction. “Those are my questions,” he quipped. “I’ll be glad to accept any answers you have.” (Photo courtesy of Steve McCaw)

Epigenomics data goes public

By Ed Kang

The NIH Roadmap Epigenomics Mapping Consortium is delivering on its promise of developing a public resource of human epigenomic data. Established around the hypothesis that epigenetics plays a critical role in human health, the mapping [consortium](#) is creating and cataloging reference epigenomes from a variety of normal human cells and tissues that investigators from the larger scientific community can use for their own comparisons.

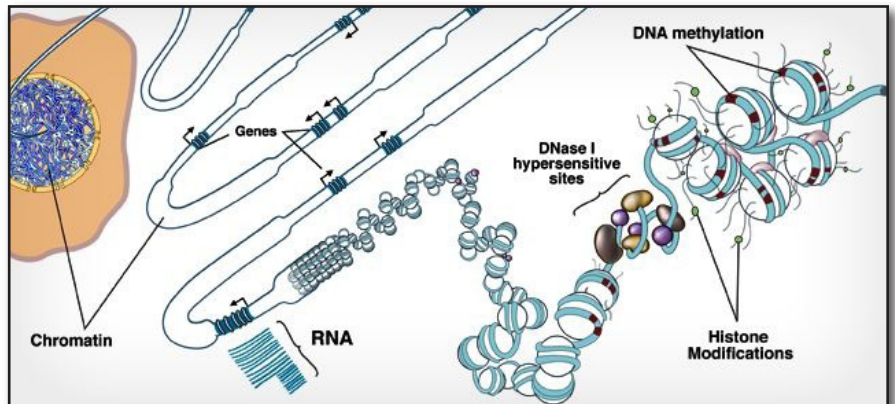
The project is part of the [Roadmap Epigenomics Program](#), an NIH Common Fund effort exploring an emerging frontier of science, which involves the study of changes in the regulation of gene activity and expression that are not dependent on gene sequence. NIEHS leads this program, along with the National Institute on Drug Abuse (NIDA). The data arising from the program will be particularly useful for environmental health scientists, because epigenetic misregulation resulting from environmental exposures is increasingly thought to be an important contributor to disease.

Mapping the human epigenome

The global analysis of epigenetic changes across the entire genome, or epigenomics, is a key focal point of the mapping activity. This has generated huge amounts of data for comparison and integration within a broad array of future studies.

Lisa Chadwick, Ph.D., and Frederick Tyson, Ph.D., program administrators in the NIEHS Division of Extramural Research and Training, are the program leads for the four Roadmap Epigenomic Mapping Centers at the Massachusetts Institute of Technology, the University of California San Francisco, the Ludwig Institute for Cancer Research, and the University of Washington.

According to Chadwick, the consortium is developing a community resource that contains epigenomic maps for a variety of adult and fetal cell and tissue types, as well as a number of embryonic and induced pluripotent stem cells. "Through the consortium, we've been successful in making protocols and data rapidly available," said Chadwick. "There is a ton of useful information available, and we've made it easy for the scientific community to access and use it," she said in reference to the data browsing capabilities that help users crunch data into usable form.



The consortium leverages next-generation sequencing technologies to map DNA methylation, histone modifications, chromatin accessibility, and small RNA transcripts in human embryonic stem cells as well as primary ex vivo tissues selected to represent the normal counterparts of tissues and organ systems frequently involved in human disease.



Chadwick is one of the NIEHS administrators for the NIH Roadmap Epigenomic Mapping Consortium. (Photo courtesy of Steve McCaw)

Chadwick sees a broader future for the data produced by the consortium. “A number of NIEHS-funded investigators have been using genome-wide association studies (GWAS) to identify susceptibility loci. The data from the mapping project have been proving to be a useful tool for interpreting GWAS hits, which often don’t immediately make sense [because] they frequently land in genomic regions that don’t have an obvious function. The epigenomic data that we are generating can be used to make predictions about the functional significance of these sequences.”

NIEHS will host an epigenetics mini-symposium Jan. 10, 2012, where some data from the Roadmap Epigenomic Mapping Consortium will be presented.

(Ed Kang is a public affairs specialist in the Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

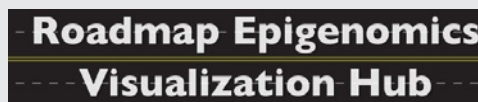


Tyson shares responsibility as co-lead on the project. (Photo courtesy of Steve McCaw)

In addition to raw data, information about protocols, quality metrics, as well as a variety of analysis tools can be found at the following websites:



<http://RoadmapEpigenomics.org>



<http://vizhub.wustl.edu>



<http://ncbi.nlm.nih.gov/epigenomics>



<http://epigenomeatlas.org>

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SRP researchers quantify PCB pollution in East Chicago harbor

By Rebecca Wilson

NIEHS-funded [University of Iowa Superfund Research Program \(SRP\)](#) researchers [Keri Hornbuckle, Ph.D.](#), and [Andres Martinez, Ph.D.](#), have found high levels of polychlorinated biphenyls (PCBs) in the deep sediment of the Indiana Harbor and Ship Canal (IHSC) in East Chicago, Ind. The findings are cause for concern because the U.S. Army Corps of Engineers has plans to begin dredging the canal in spring 2012 to maintain the shipping lanes in this active harbor.

The study's [results](#) were published in the Sept. 6 online edition of *Chemosphere*, building upon a previous study showing that airborne PCBs in the area originated in the water and sediments below ([see story](#)). In the new study, the researchers drilled into the canal floor and analyzed core sediment samples. One of the samples yielded a PCB concentration exceeding 50 parts per million, the U.S. Environmental Protection Agency (EPA) threshold for hazardous waste. That means that the IHSC is eligible to be listed on the National Priorities List (NPL) and become a Superfund site.

Could dredging uncover PCBs deposited more than 30 years ago?

PCBs are a class of organic compounds, roughly half of whose 209 congeners, or forms of PCB, were widely used in industrial applications and products such as coolants, solvents, and paint. Due to their toxicity and persistence, the manufacture of PCBs was banned in the U.S. in 1979. They can enter the human body from eating or drinking contaminated food, inhalation, or dermal contact. The EPA has indicated that the chemicals can have several different health endpoints, including cancer, depending on the particular congener.

The study found that deeper canal sediments in their samples yielded a higher concentration of PCBs than sediments nearest the surface. This result was not a surprise to the researchers because, according to Martinez, the canal was last dredged in 1972, prior to the ban of PCBs. Any new sediment being deposited in the canal at that time could have been contaminated by chemicals present there.

Interestingly, the deepest sediments, while more contaminated than sediments near the surface, were less contaminated than the sediments a meter below the surface, which has important implications for the planned dredging. If the sediment there is exposed, then the long-term release of PCBs from the surface sediments to the water will increase. "It will be really bad if they [the dredgers] leave a high PCB concentration in the surface sediment," Hornbuckle said.

The researchers are careful to point out that these findings reflect results from only two core samples. "We cannot tell what the trends could be with depth for the regions of the canal and harbor that will be dredged," noted Hornbuckle, referring to the unsampled regions of the harbor.

Citation: [Martinez A, Hornbuckle KC](#). 2011. Record of PCB congeners, sorbents and potential toxicity in core samples in Indiana Harbor and Ship Canal. *Chemosphere*; doi: 10.1016/j.chemosphere.2011.08.018 [Online 6 September 2011].

(Rebecca Wilson is an environmental health information specialist with MDB, Inc., a contractor for the NIEHS Superfund Research Program and Worker Education and Training Program.)

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EPA employees assisted Hornbuckle and Martinez with sample collection. Here, they separate a sediment core into pieces. (Photo courtesy of Andres Martinez)



Andres Martinez, left, and an EPA employee collect samples from the Indiana Harbor and Ship Canal in East Chicago, Ind. (Photo courtesy of Keri Hornbuckle)

This month in EHP

By Ian Thomas

In its annual Children's Health issue, [Environmental Health Perspectives \(EHP\)](#) highlights new research into the potential effects of psychological stress on children's response to environmental pollutants. Although stress has been hard to quantify and measure, a small group of researchers is finding new ways to address these issues and explore stress-pollution interactions and their impacts on children's health.

Another story, titled "Advising Parents in the Face of Scientific Uncertainty: An Environmental Health Dilemma," reports on collaborations among researchers and clinicians to better inform parents about the current understanding of potential environmental health hazards.

In this month's [Researcher's Perspective](#) podcast, host Ashley Ahearn speaks with NIEHS researcher [Suzanne Fenton, Ph.D.](#), regarding the growing number of young girls experiencing early puberty and the possible role of environmental exposures in mammary gland development.

In addition to more than a dozen children's health research articles, this month's featured commentary, reviews, and research include:

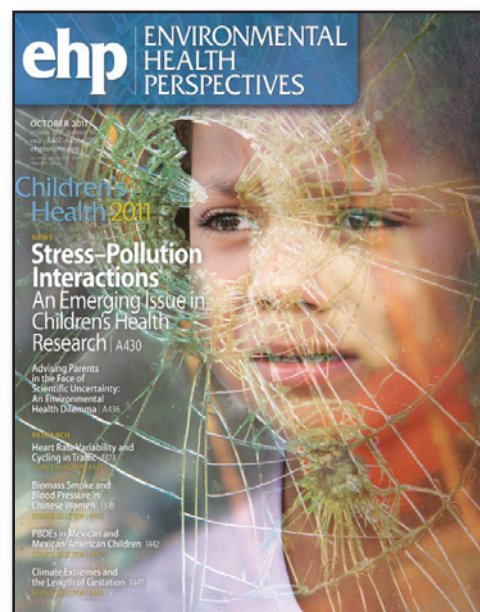
- Heart Rate Variability and Cycling in Traffic
- Biomass Smoke and Blood Pressure in Chinese Women
- Peat Bog Wildfire Smoke Exposure and Cardiopulmonary Emergency Department Visits in Rural North Carolina
- Arsenic Toxicology: Translating between Experimental Models and Human Pathology

(Ian Thomas is a public affairs specialist in the NIEHS Office of Communications and Public Liaison.)

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<http://twitter.com/ehponline>



Upcoming NIEHS workshop on erionite and mesothelioma

By Melissa Kerr

NIEHS will host a workshop exploring the state-of-the-science surrounding the mineral erionite and its potential threat to human health Oct. 12 in Rodbell Auditorium. The interdisciplinary, interagency workshop was developed by NIEHS Senior Medical Adviser, [Aubrey Miller, M.D.](#), to educate scientists on the state of the science concerning erionite exposure and its public health implications ([see text box](#)).

Two recent NIH-funded studies underscore the importance to environmental health sciences of understanding more about this mineral, which has been found in at least 12 U.S. states.

Erionite and mesothelioma in North Dakota and Turkey

Exposure to erionite and the resulting malignant mesothelioma (MM) have been known to result in devastating effects on human health as seen in Turkish villages. In some of these Turkish villages 20-50 percent of all deaths are caused by MM. A new [study](#) by an NIH-funded research team headed by Miller and Director of the University of Hawaii Cancer Center [Michele Carbone, M.D., Ph.D.](#), found a link between what has been happening in Turkish villages and erionite exposures, and what could happen by mid-century in such places as Dunn County, N.D.

Dunn County is a place of interest because the North Killdeer Mountains there contain erionite. Within the county, approximately 300 miles of road have been paved using gravel from the erionite-containing mountains. As the researchers explain, “There are no health benchmarks established in the United States to regulate or provide guidance for use and exposures to erionite.”

Health concerns regarding this mineral may go unrecognized due to a latency period of 30 years or more between exposure and the development of MM, confounding by asbestos exposures, and the small number of exposed populations. Miller and his team took several air samples in various Turkish villages where increased MM was known to be associated with erionite as well as various places around Dunn County. The results show that many of the readings in North Dakota are comparable to those from the village of Boyali, Turkey where 6.25 per cent of all deaths are caused by MM.

The researchers called for the Early Detection Research Network of the National Cancer Institute (NCI) to begin working with the Turkish Ministry of Health in hopes of defining markers for early detection of MM. The authors said that resources need to be focused on studying exposure, genetics, mechanisms of toxicity, and prevention strategies. “Our findings,” the researchers concluded, “indicate that implementation of novel preventive and early detection programs in ND and other erionite-rich areas of the United States, similar to efforts currently being undertaken in Turkey, is warranted.”

Gene-environment interactions in malignant mesothelioma

In what Miller describes as a seminal [paper](#) in the search for prevention strategies in regard to mesothelioma, Carbone led a team that explored the possibility of genetic predisposition in developing MM. The research team, funded in part by NCI, discovered that mutations in the BRCA1 associated protein-1 (BAP1) have a link with the development of MM and uveal melanoma, a cancer of the eye.

BAP1 is a nuclear protein that acts as a tumor suppressor in the BRCA1 growth control pathway. Carbone’s team found that the mutations of BAP1 have a familial connection. He pointed out that mesothelioma clustering has been seen before in families from the U.S. and Turkey. The researchers sequenced BAP1 germline DNA and found that six individuals within the same family, who developed some kind of cancer, had identical mutations. Family members who were not affected did not show the same mutation.



Miller and Carbone closed their PNAS paper by stressing, “[Prevention strategies] would be of immediate benefit to the population of North Dakota and other erionite-rich areas of the United States, to reduce the potential for disease and limit adverse effects among those already exposed.” (Photo courtesy of Steve McCaw)

The BAP1 mutation has been associated with not only mesothelioma and uveal melanoma, but it is believed to play a role in other cancers as well. The research suggests that persons who display this mutation are much more likely to develop mesothelioma when an exposure to asbestos occurs. The author suggests that even the BAP1 mutation itself could potentially be all that is necessary for a person to develop mesothelioma.

Understanding the role that BAP1 plays in the onset of mesothelioma, as well as the potential role in other cancers, may be a highly useful diagnostic tool. The authors conclude, “These findings will help to identify individuals at high risk of mesothelioma who could be targeted for early intervention.”

Citations:

Carbone M, Baris YI, Bertino P, Brass B, Comertpay S, Dogan AU, Gaudino G, Jube S, Kanodia S, Partridge CR, Pass HI, Rivera ZS, Steele I, Tuncer M, Way S, Yang H, Miller A. 2011. Erionite exposure in North Dakota and Turkish villages with mesothelioma. *Proc Natl Acad Sci U S A*. 108(33):13618-13623.

Testa JR, Cheung M, Pei J, Below JE, Tan Y, Sementino E, Cox NJ, Dogan AU, Pass HI, Trusa S, Hesdorffer M, Nasu M, Powers A, Rivera Z, Comertpay S, Tanji M, Gaudino G, Yang H, Carbone M. 2011. Germline BAP1 mutations predispose to malignant mesothelioma. *Nat Genet*; doi: 10.1038/ng.912 [Online 28 August 2011].

(Melissa Kerr studies chemistry at North Carolina Central University. She is currently an intern in the NIEHS Office of Communications and Public Liaison.)

Facing the potential health effects of erionite exposure

Erionite is a naturally occurring mineral that forms ultra-fine fibrous masses and can be found in rock formations. Erionite is a concern due to the fact that some of the properties of the material are similar to the properties of asbestos. There is concern that erionite may be associated with an increased risk of lung cancer and mesothelioma, a deadly cancer of the smooth lining of the chest, lungs, heart, and abdomen. According to the Centers for Disease Control and Prevention, between 1999 and 2005 there were 18,083 deaths in the United States attributed to malignant mesothelioma.

Miller hopes for a several outcomes from the workshop. Through a comprehensive discussion, he would like for interested stakeholders to have the ability to move forward with a standard base of knowledge concerning erionite. He also hopes to bring forth ideas for further research and collaboration. The final goal of the workshop is to specify short-term and long-term actions needed to “advance scientific understanding and help to address ongoing public health concerns.”

The workshop agenda is still being finalized. However, tentative topics and discussion leaders include:

- **Mineralogy and Morphology**, moderated by geologist Greg Meeker, of the U.S. Geological Survey (USGS) [Denver Microbeam Laboratory](#)
- **Exposure Assessment**, moderated by NIEHS Toxicology Liaison [Christopher Weis, Ph.D.](#)
- **Epidemiologic Research**, moderated by [James Lockey, M.D.](#), of the University of Cincinnati
- **Clinical and Genetics Research**, moderated by [Harvey Pass, M.D.](#), of the New York University Medical Center
- **Mechanistic/Toxicology Research**, moderated by [Michele Carbone, M.D., Ph.D.](#), University of Hawaii Cancer Center
- **Public Health Concerns and Issues/Open Discussion**, moderated by [Stephen Levin, M.D.](#), of the Mount Sinai School of Medicine

Representatives of several agencies interested in the problem of erionite and MM will be attending or participating by remote hook-up. They include staff from NIEHS, USGS, the U.S. Environmental Protection Agency, the National Institute for Occupational Safety and Health, the National Institute of Standards and Technology, and the National Toxicology Program. NIEHS/NTP Director Linda Birnbaum, Ph.D., is scheduled to give opening remarks.

Extramural papers of the month

By Jerry Phelps

- Carbon nanotubes: Cells bite off more than they can chew
- Widespread RNA/DNA mismatch
- Reprogramming adult fibroblasts into functional neurons
- Mold exposure during infancy increases risk of asthma



Read the current Superfund Research Program [Research Brief](#). New issues are published on the first Wednesday of each month.

Carbon nanotubes: Cells bite off more than they can chew

NIEHS-supported researchers report on the mechanics of how cells begin to engulf carbon nanotubes, only to discover too late their cause is doomed. Carbon nanotubes closed on one end appear like spheres to the cells. The cells begin to engulf the rounded end and often orient the nanotube so that it is perpendicular to the cell membrane. As the nanotube brushes up against the membrane, special receptors send signals causing the cell to wrap its membrane around the nanotube and tip it to a 90-degree angle, effectively reducing the amount of energy needed for the cell to engulf what it senses as a small particle.

Once the engulfing process begins, there is no corresponding signal to stop and reverse the process. Within minutes, the cell senses it will not be able to completely engulf the nanotube. After that, an immune response is mounted that can result in chronic inflammation, very similar to the reaction of cells to asbestos fibers.

Carbon nanotubes have been touted to have a variety of uses in material science and also in medicine as targeted drug delivery devices. The team will continue this line of research with nanotubes with blunt ends or nanoribbons to determine if these structures are less harmful to cells.

Citation: Shi X, von dem Bussche A, Hurt RH, Kane AB, Gao H. 2011. Cell entry of one-dimensional nanomaterials occurs by tip recognition and rotation. *Nat Nanotechnol*; doi: 10.1038/nnano.2011.151 [Online 18 September 2011].

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Widespread RNA/DNA mismatch

University of Pennsylvania grantees report that when DNA is transcribed into RNA, the RNA copy is a lot less exact than previously thought. These mistakes or differences result in proteins that do not exactly match the genes that encode them, suggesting a new unexplored area of variation in the human genome.

The researchers sequenced the genomes of 27 individuals. They found more than ten thousand places where the RNA did not match the DNA. At first, they thought the differences might be attributable to technical problems, but numerous experiments confirmed the results. While performing these extra experiments, they noticed that, many times, a single RNA base was changed in exactly the same manner. For example, a site that should be AA was always AC. Every individual would either have the original AA or the edited AC, but no other possible combination.

These changes resulted in protein differences that ranged from minor single amino acid substitutions, to a protein that was 55 amino acids longer than it should have been. At this point, the researchers do not know how these changes occur or the implications of the resulting differences in protein structure and function. Further research is necessary to understand any effects resulting from these changes, such as differences in susceptibility to certain diseases.

Citation: [Li M, Wang IX, Li Y, Bruzel A, Richards AL, Toung JM, Cheung VG](#). 2011. Widespread RNA and DNA sequence differences in the human transcriptome. *Science* 333(6038):53-58.

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Reprogramming adult fibroblasts into functional neurons

An NIEHS-supported research team reports accomplishing direct reprogramming of human fibroblasts into functional neurons. The reprogrammed cells look and act like typical neurons and represent a possible step forward in treating neurodegenerative diseases.

Previously, research teams have produced functional neurons from pluripotent stem cells; however, the harvesting of pluripotent stem cells is fraught with ethical and legal issues. Somatic cells have been converted to stem cells and then differentiated into neuronal cells, but this technique is also not without issues, in that some research indicates that the technique can induce the cells to become cancerous.

The California-based researchers report that a combination of a microRNA and two transcription factors is sufficient to directly reprogram human primary dermal fibroblasts into functional neurons under controlled conditions. The induced neurons exhibit morphology, form synapses, and exhibit action potentials just like typical neurons.

These findings could have major implications in disease modeling, neurodevelopment research, and for cell-replacement therapies for neurodegenerative diseases.

Citation: [Ambasudhan R, Talantova M, Coleman R, Yuan X, Zhu S, Lipton SA, Ding S](#). 2011. Direct reprogramming of adult human fibroblasts to functional neurons under defined conditions. *Cell Stem Cell* 9(2):113-118.

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Mold exposure during infancy increases risk of asthma

Children who live in moldy homes are three times more likely to develop asthma by age 7, according to new NIEHS-funded research. The researchers point out that genetic factors also play a role in early asthma development, as children whose parents have asthma are at the greatest risk.

The children were part of the Cincinnati Childhood Allergy and Air Pollution Study, a long-term effort that includes more than 700 children, with 176 identified at birth as being at high risk to develop asthma based on family history. Mold exposure levels were measured using a new tool developed by the EPA that combines 36 different mold types into one index, which accurately described the mold burden in the children's homes.

By age seven, 36 of the 176 children had developed asthma. Children living in homes with high mold content at one year of age were more than twice as likely to develop asthma. The timing of the exposure seems to be critical because living in high mold homes later in life was not correlated with developing asthma. Of all the other factors examined, only dust mite allergy and parental asthma were linked to asthma development. Air-conditioning reduced the risk of asthma.

The results of this study suggest that parents of young children should pay careful attention to poor water drainage and other issues that contribute to mold development in their homes, especially if the parents themselves have a medical history of asthma.

Citation: [Reponen T, Vesper S, Levin L, Johansson E, Ryan P, Burkle J, Grinshpun SA, Zheng S, Bernstein DI, Lockey J, Villareal M, Khurana Hershey GK, Lemasters G. 2011. High environmental relative moldiness index during infancy as a predictor of asthma at 7 years of age. Ann Allergy Asthma Immunol 107\(2\):120-126. \[Story\]\(#\)](#)

(Jerry Phelps is a program analyst in the NIEHS Division of Extramural Research and Training.)

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Intramural papers of the month

By Raluca Dumitru, Ian Thomas, and Darshini Trivedi

- [Neonatal exposure to estrogenic environmental chemicals may contribute to infertility](#)
- [New software analyzes next-generation sequencing data](#)
- [Mitochondrial targeting of phospholipid scramblase 3 depends on palmitoylation](#)
- [COX-2 is a key regulator of Th17 cell differentiation in allergic lung inflammation](#)

Neonatal exposure to estrogenic environmental chemicals may contribute to infertility

In a new study from NIEHS, scientists found that giving newborn female mice genistein, a compound that behaves like estrogen and is found in soybean-derived products, altered proper development of the reproductive tract. As adults, these mice had oviducts with characteristics of the cervix and vagina, and failed to support proper early embryo development. Because human infants consuming soy-based formulas have similar blood levels of genistein, this work could have implications for unexplained infertility in humans.

Investigators treated a group of female mouse pups with genistein, and measured various regions of their reproductive tracts for alterations in structure and gene expression. When compared to corn oil-treated controls, the genistein-treated mice had substantial changes in expression of genes that control neonatal oviduct development. An estrogen receptor antagonist blocked these effects, demonstrating that genistein's estrogenic activity induced the changes in gene expression. Many of the oviduct changes persisted through adulthood, even though the treatment was for only five days at birth.

The results of this study support the hypothesis that mammalian exposure to low levels of estrogenic environmental chemicals, during sensitive developmental windows, may alter certain aspects of human reproductive development. These changes could manifest later in life as an infertility phenotype.

Citation: [Jefferson WN](#), [Padilla-Banks E](#), [Phelps JY](#), [Gerrish KE](#), [Williams CJ](#). 2011. Permanent oviduct posteriorization following neonatal exposure to the phytoestrogen genistein. *Environ Health Perspect*; doi:10.1289/ehp.1104018 [Online 2 August 2011].

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New software analyzes next-generation sequencing data

Recently, NIEHS investigators reported the development of EpiCenter, a novel statistical method and software tool for the analysis of high-throughput next-generation sequencing (NGS) data. The software, which is freely available to the public, may be used to detect changes in epigenetic marks with ChIP-seq data or gene expression with mRNA-seq data. Since the researchers have proven its effectiveness by successfully analyzing histone ChIP-seq and mRNA-seq data from multiple studies, EpiCenter promises to become an indispensable tool in bioinformatics.

Before the creation of EpiCenter, the large volume of NGS data, together with the evolution of new technologies and applications, made NGS data analysis a barrier in biomedical research. EpiCenter changes all of that by providing multiple normalization methods to achieve appropriate normalization under different scenarios, using a sequence of three statistical tests to eliminate background regions and to account for different sources of variation, and allowing adjustment for multiple testing to control false discovery rate or family-wise type I error.

In addition, the software can identify genome-wide epigenetic changes or differentially expressed genes, find transcription factor binding sites, and convert multiple-sample sequencing data into a single read-count data matrix.

Citation: [Huang W](#), [Umbach DM](#), [Vincent Jordan N](#), [Abell AN](#), [Johnson GL](#), [Li L](#). 2011. Efficiently identifying genome-wide changes with next-generation sequencing data. *Nucleic Acids Res*; doi:10.1093/nar/gkr592 [Online 29 July 2011].

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Mitochondrial targeting of phospholipid scramblase 3 depends on palmitoylation

A new collaborative effort between three laboratories within NIEHS identified an important role for palmitoylation in the subcellular localization of the mitochondrial protein phospholipid scramblase 3. S-palmitoylation, a post-translational modification, promotes the subcellular localization of proteins in several biological pathways, making it an attractive means for manipulating protein targeting. However, study of palmitoylation has been hampered due to limited understanding of its enzymology and consensus motifs. This research effort is the first to show the targeting of a protein to mitochondria by palmitoylation.

The authors identified palmitoylated proteins by performing an acyl-biotinyl exchange proteomic screen in macrophages. One of the identified palmitoylated proteins was phospholipid scramblase 3 (Plscr3), a protein that regulates mitochondrial function by remodeling the mitochondrial outer membrane. Next, the authors identified the region of Plscr3 involved in palmitoylation and demonstrated, by site-directed mutagenesis, that the locus is important for Plscr3 targeting mitochondria, as well as for macrophage apoptosis.

This study provides an important insight into how a proteomic approach can identify acylated proteins. Moreover, the manipulation of protein palmitoylation may offer a promising opportunity for intervention in macrophage biology.

Citation: [Merrick BA, Dhungana S, Williams JG, Aloor JJ, Peddada S, Tomer KB, Fessler MB. 2011. Proteomic profiling of S-acylated macrophage proteins identifies a role for palmitoylation in mitochondrial targeting of phospholipid scramblase 3. Moll Cell Proteomics; doi:10.1074/mcp.M110.006007 \[Online 23 July 2011\].](#)

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COX-2 is a key regulator of Th17 cell differentiation in allergic lung inflammation

A new study from NIEHS uncovers the role that cyclooxygenase (COX) enzymes play during allergic lung inflammation. COXs are responsible for the production of prostaglandins (PGs), which regulate inflammatory responses. This report is the first to show that one of the COX enzymes, COX-2, is the key regulator of T helper 17 (Th17) cell differentiation and function in the allergic lung. Th17 cells secrete IL-17 which promotes inflammation by increasing cytokine and chemokine secretion in multiple lung cell types and by increasing the number of neutrophils in the lung.

To determine whether COX-1 or COX-2 regulated Th17 cells, the authors used ovalbumin to induce allergic airway inflammation in wild-type, COX-1 knockout and COX-2 knockout mice. The results showed that the number of Th17 cells in the lung was dramatically reduced in COX-2 knockout mice, but not in COX-1 knockout mice, relative to wild-type. Also, the researchers found that Th17 cell differentiation and function was impaired in COX-2 knockout mice. Importantly, PG production was decreased in Th17 cells from COX-2 knockout mice and the Th17 cell defects were reversed by giving PGs *in vitro* and *in vivo*.

The results of this study demonstrate that COX-2 is a critical regulator of Th17 differentiation and function. The research opens up the possibility that COXs could regulate the function and differentiation of other T-cell subsets. The investigators speculate that targeting COX-2 and/or PG signaling pathways may represent a novel approach to the treatment of allergic lung disease in humans.

Citation: [Li H, Bradbury JA, Dackor RT, Edin ML, Graves JP, DeGraff LM, Wang PM, Bortner CD, Maruoka S, Lih FB, Cook DN, Tomer KB, Jetten AM, Zeldin DC. 2011. Cyclooxygenase-2 regulates Th17 cell differentiation during allergic lung inflammation. Am J Respir Crit Care Med 184\(1\):37-49.](#)

(Raluca Dumitru, M.D., Ph.D., is an Intramural Research Training Award fellow in the NIEHS Stem Cell Biology Group of the Laboratory of Molecular Carcinogenesis. Ian Thomas is a public affairs specialist in the NIEHS Office of Communications and Public Liaison. Darshini Trivedi, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Metabolism and Molecular Mechanism Group of the Laboratory of Toxicology and Pharmacology.)

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Inside the Institute

NIEHS honors staff for years of service

By Ian Thomas

NIEHS held its annual Years of Service Awards ceremony Sept. 6 in Rodbell Auditorium. Hosted by NIEHS/NTP Director Linda Birnbaum, Ph.D., the gathering recognized 40 Institute employees, commemorating career milestones of 10, 20, 30, and 40 years of federal service.

“As government employees, we all know that, first and foremost, our top responsibility is to serve the American people,” said Birnbaum. “Here at NIEHS, that means maintaining a strong commitment to funding and supporting groundbreaking research. This requires a lot of hard work and dedication. But beyond the hours, it requires a very unique type of individual.”

Assisted by NIEHS Deputy Director Richard Woychik, Ph.D., Birnbaum presented each honoree with a framed certificate and a big congratulatory handshake, all captured by a photograph. At the conclusion of the ceremony, the awardees were joined by their peers, as well as several members of NIEHS leadership, for a cake and ice cream reception in the main lobby of the Rall building.



In her opening remarks, Birnbaum praised awardees for commitment to service and dependability as public servants. (Photo courtesy of Jennifer Weinberg)

Employees and their milestones

10 Years:

- Danica Andrews
- David Balshaw
- Jeannie Bell-Nichols
- Dianne Gray
- Edward Kang
- Huei-Chen Lao
- Fred Lih
- Jacqueline Marzec
- Michelle Mayo
- Geoffrey Mueller
- Srikanth Nadadur
- Charles Romeo
- Valarie Sims
- William Steinmetz
- Xianhong Yu

20 Years:

- Kathy Ahlmark
- Gary Bird
- Paula Brown
- Matthew Burr
- Joyce Daye
- Carolyn Hall
- Ronald Herbert
- Robin Jones
- Alicia Moore
- Sheila Newton
- Elizabeth Ney
- Robert Sills
- Kent Stone
- Thai-Vu Ton
- Frederick Tyson
- Francisca Wagstaff
- Richard Weaver
- Robert Wine

30 Years:

- Pamela Clark
- Laura Hall
- William Quattlebaum
- Velvet Torain
- Betty Wilkins

40 Years:

- Thomas Eling
- Amy Johnson



NIEHS Chief of Staff Paul Jung, M.D., served cake to employees, during the reception that followed the awards ceremony. (Photo courtesy of Jennifer Weinberg)

(Ian Thomas is a public affairs specialist in the NIEHS Office of Communications and Public Liaison.)

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Birnbaum presents a plaque, for his decade of service, to Public Affairs Specialist Ed Kang. (Photo courtesy of Jennifer Weinberg)



Staff scientists Gary Bird, Ph.D., left, a 20-year veteran, and Charles "Chip" Romeo, Ph.D., who celebrated a decade in government service, enjoyed some banter, as they prepared to get their refreshments. (Photo courtesy of Jennifer Weinberg)



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